Review

Current Urology

OPEN

Patient consent in the modern era: Novel tools and practical considerations in urology

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Abstract

Informed consent is a cornerstone of ethically acceptable surgical interventions. Traditional methods primarily rely on verbal explanations by clinicians and, at times, the use of supplementary resources such as information leaflets. In the modern era, novel tools have emerged to facilitate and enhance the consent process. Examples include multimedia, 3D models, virtual and augmented reality, quick response codes, and artificial intelligence technologies such as large language models. This narrative review provides an overview of these aids, discussing their potential advantages and limitations. In addition, the influence of social media on the consent process is explored.

Keywords: Social media; Urology; Consent; Surgery

1. Introduction

Informed consent (IC) is a core tenet of modern medicine, particularly in the context of surgical procedures, where patients must fully understand the potential benefits, and risks. Although formal consent is not a statutory requirement in many countries, it is regarded as a standard of professional practice.[1,2] The key components of IC include explaining the procedure, discussing alternatives and potential risks, addressing patient questions, and ensuring thorough documentation in medical records. Proper implementation of the consent process is particularly importance for specific patient demographics, such as children and older adults. A recent review of 570 medical records of patients older than 70 years who underwent surgery at a medical center in Norway revealed that 18% lacked any recorded assessment concerning consent in their notes.[3] In addition, a study evaluating medical litigation in the UK National Health Service between 1996 and 2019 found that 9% of claims were related to consent.[4] Given the recognized importance of IC in the modern era and advancements in technology, including multimedia and artificial intelligence (AI), such as large language models, innovative applications have been developed to improve the consent process and patients' level of comprehension. This narrative review aims to provide an overview of technology-supported devices and modalities as tools to improve consent procedures in the field of urology.

2. Materials and methods

A comprehensive literature search was conducted to identify the key studies on patient consent in the context of emerging technologies. The MEDLINE and Google Scholar bibliographic databases were searched using terms such as consent, digital technology, artificial intelligence, multimedia, virtual and augmented reality, and 3D printing, along with relevant Medical Subject Headings terms. All article types were considered, with an emphasis on studies published within the past 10 years. The findings are presented in a narrative format, grouped into the following key areas: tools to aid the consent process, information quality and health literacy, social media (SoMe) and consent, areas of concern, special situations, and future research.

3. Tools to aid the consent process

3.1. Quick response codes

Quick response (QR) codes are 2-dimensional barcodes that, when scanned with a smartphone or tablet, direct users to specific websites (Table 1). In the context of patient consent, QR codes can deliver detailed information regarding surgical procedures. This technology became widely used during the COVID-19 pandemic as a contact-free method of information sharing. Mittal et al.[5] investigated the best method to apply QR codes in a clinical setting, particularly in a urology outpatient clinic. The intervention was a combination of printed British Association of Urological Surgeons patient information leaflets with QR codes that linked to additional online resources. These leaflets were strategically placed in the urology department for easy access. In collaboration with 108 urologists, the

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Current Urology, (2025) 19, 4, 235–240

Received September 2, 2024; Accepted January 7, 2025.

http://dx.doi.org/10.1097/CU9.0000000000000282

Table 1

Summary of key studies.

Author	Year	Study type	Key findings
QR codes			
Mittal et al.[5]	2022	Online survey	QR codes offer benefits, including capability for touch-free access, cost-effectiveness, potential to increase engagement, and understanding
Chen[6]	2023	RCT	Ongoing
3D models			
Scott et al.[7]	2023	Survey	Better patient understanding, improved surgeon and trainee comprehension, and self-confidence
Hameed et al.[8]	2022	Review	3D printing is helpful in visualizing patient anatomy better and aiding preoperative planning, training of residents, and improving the expertise of junior residents in procedures to treat nephrolithiasis
Nedbal et al.[9]	2024	Systematic literature review	Significantly improved understanding of diagnosis, anatomy, aim, steps, and risks of surgery, as well as patients' overall satisfaction
Wake et al.[10]	2019	Likert scale-based survey	Better understanding of anatomy, disease, tumor characteristics, and surgical procedure
Multimedia			
Haack et al.[11]	2023	RCT	Multimedia-supported IC before consultation saved time compared with traditional paper-based IC, with comparable levels of satisfaction, anxiety and information
Sullivan et al.[12]	2023	Prospective cohort	Improved confidence of interns and attending physicians on IC after didactic sessions and standardized patient encounters
Telemedicine			
Connor et al.[13]	2019	Prospective	Specialist-led acute ureteric colic virtual clinic reduced time to treatment decision, saved cost, created additional clinic capacity, and reduced associated carbon footprint
Halder et al.[14]	2022	RCT	Better patient preparedness for urogynecological surgery
Sassani et al.[15]	2021	RCT	Patients reported equivalent levels of preparedness for pelvic organ prolapse surgery after preoperative counseling phone calls vs. clinic visit, with most preferring telephone calls
Virtual reality			
Flockton A.[16]	2017	Prospective	VERT systems education led to better understanding of radiation treatment and technology, as well as the rationale for a full bladder and empty rectum before radiotherapy
Marquess et al.[17]	2017	Prospective	VERT education led to decreased anxiety and better understanding of radiotherapy
Pandrangi et al.[18]	2019	Cross-sectional	Patients felt better informed and more engaged in their health care after use of virtual reality headsets
Social media			
Tzelves et al.[19]	2024	TikTok content review	Significant level of misinformation regarding vasectomy
Juliebø-Jones et al.[20]	2023	Instagram content analysis	Poor adherence to EAU recommendation regarding consent for SoMe surgical images

3D = 3-dimensional; EAU = European Association of Urology; IC = informed consent; QR = quick response; RCT = randomized controlled trial; SoMe = social media; VERT = virtual environment radiation training.

authors evaluated patient responses to QR code posters. During this period, the dissemination of printed leaflets was reduced. When surveyed, most patients claimed to have seen a QR code at some point, yet only 40% knew what they were, and 61% said that the posters were informative, suggesting that QR codes can be a powerful tool for patient information. The authors also reported projected cost savings of £3120 per year due to reduced leaflet printing.[5] However, challenges such as patients' technological competency and access to reliable Internet connectivity persist, particularly among older adults. For instance, only 40% of patients aged 60 to 80 years found QR codes easy to use, whereas 60% reported difficulty.[5] Quick response codes also enable the integration of AI chatbots that can facilitate patient-physician interactions. For example, Chen et al.[6] are currently conducting a randomized controlled trial to evaluate the impact of an AI chatbot assessed via QR codes on self-management and decision-making in men with lower urinary tract symptoms caused by enlarged prostate, with or without erectile dysfunction. The chatbot provides self-management advice for individuals with erectile problems, urinary complaints, and prostate enlargement. In addition, it offers instruments for patient-centered decision-making intended to empower and support patients, especially with regard to enhancing erectile function and urination.

3.2. Multimedia

Multimedia, in the form of videos and animations, can improve the clarity of information disclosed to patients. Paper-based information sheets often contain excessive content, making it difficult for patients to read and comprehend.[11] Multimedia can help eliminate the use of complex medical terms, thereby improving patients' comprehension and confidence regarding surgery. They may align with the needs of patients with different learning styles and help enhance information assimilation, as visuals and sounds are used interchangeably. Research has revealed that multimedia platforms can positively affect patient understanding and satisfaction levels. In a study on digital informed consent for urological surgery study, multimedia-supported IC was compared with traditional means in a randomized fashion among patients scheduled for prostate biopsy.[11] This study showed that the use of multimedia information before consultation helped save time. Overall, it took 32.9% less time to obtain paper-based consent and 60.4% less time to use the shared multimedia information with the consultant. Furthermore, the mean anxiety scores of all participants were similar, indicating that the use of multimedia tools was beneficial for expediting the consent process without negatively affecting the patients' mental health.

3.3. Telemedicine

Telemedicine uses digital communication technologies to automate remote consultations. This can also be applied to the consent process in what is referred to as "teleconsent."[21,22] Telemedicine enables clinicians to explain surgical procedures, steps, and other relevant details to patients and their caregivers (Fig. 1).[23] Telemedicine offers advantages, such as accessibility and convenience. This includes reducing travel burden, particularly for individuals living in rural areas, older adults, and those with limited mobility.[21] Connor et al.[13] established a virtual clinic and reported the

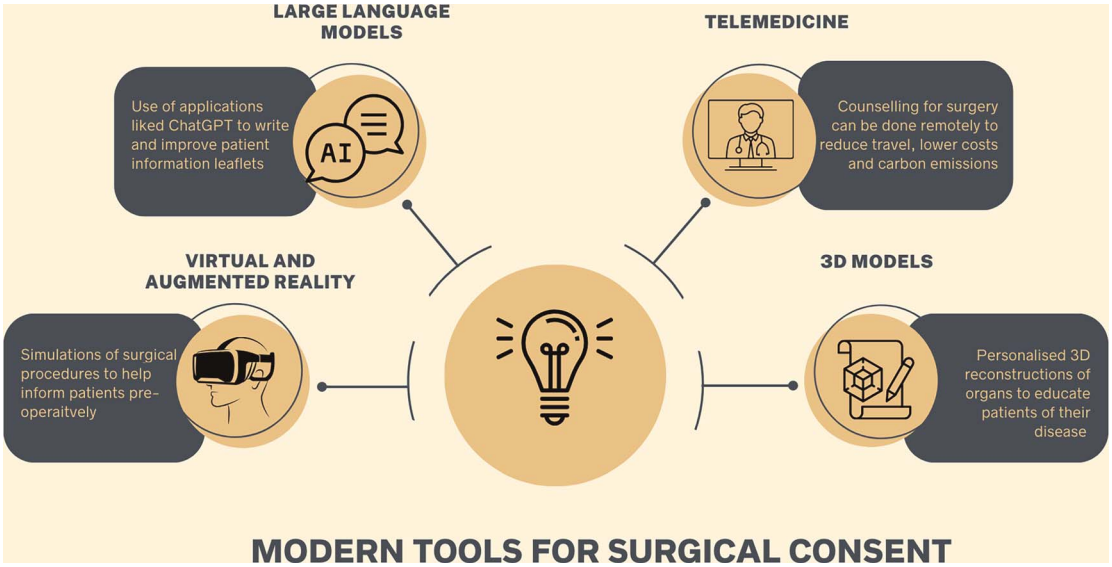

Figure 1. Summary of novel tools for consent in urology.

outcomes of 1008 patients. The clinic eliminated the need for a cumulative 15,085 km of patient travel, reducing environmental impacts such as reduced carbon emissions. Furthermore, electronic consent forms, instead of handwritten consent forms, are feasible for remote signs. This issue involves not only accelerating the administrative aspects of the consent process but also ensuring that consent documents are readily accessible.

The impact of preoperative provider-initiated telehealth communication on surgical preparedness in urogynecology was evaluated by Halder et al.[14] Compared with women who received only traditional preoperative counseling, those who participated in preoperative telehealth calls demonstrated noticeably greater preparedness for surgery. These calls enhanced patients' belief that nurses and doctors had sufficiently prepared them for their impending surgery, which linked to preoperative telehealth calls, as well as an increased understanding of surgical options, problems, and hospital-based catheter care. In addition, Sassani et al.[15] found that preoperative phone counseling was just as effective as in-person counseling in getting patients ready for pelvic organ prolapse surgery. A majority of women expressed a preference for phone communication, and more women in the phone group than in the office group stated that they would choose to phone counseling in the future.

Despite these benefits, there are still limitations to such virtual consultations, one of which is decreased real-time communication and face-to-face interaction with patients. Therefore, the potential for assessing their understanding of the information provided is limited. The use of telemedicine to obtain consent in a pediatric setting has also been found to be more challenging and less suitable. Furthermore, technical challenges include interruptions during the consent process due to poor Internet connection or a lack of knowledge of using digital tools. These challenges may force patients to encounter problems using or accessing telemedicine solutions, leading to a lag in information transfer or misunderstandings. Furthermore, privacy and data security concerns remain significant, given the electronic transfer and storage of personal medical information.

3.4. Virtual and augmented reality

Virtual reality (VR) and simulators have become viable solutions for patient and surgeon education.[24] These technologies can be used for first-hand training of surgeons and medical students, and for patients, first education on the relevant anatomy and surgical steps related to their upcoming surgery.[25] Research on the application of VR to obtain patient consent for surgical procedures has yielded promising results. Flockton[16] incorporated Virtual Environment Radiotherapy Training (VERT) system into educational sessions for prostate radiation treatment and defined its value on patients' understanding of radiation therapy and the necessity of a full bladder and empty rectum during prostate cancer radiation therapy. According to the results, VERT engaged men when discussing radiation treatment, which may initiate further information sharing and encourage peer support. Marquess et al.[17] assessed the potential of VERT for patient comprehension and anxiety levels before the procedure. Almost all pre-/post-test variables were statistically significant, supporting the hypothesis that better education and decreased anxiety are associated with virtual simulation.

The use of VR and simulators in urological surgery presents both advantages and limitations. On the positive side, VR can provide deeper visualization of the urological organs and procedures to be performed, which can be especially beneficial for patients with complex urological diseases. This detailed understanding help patients grasp their condition and the necessary intervention. When patients are fully involved in surgical planning, they are more likely to follow instructions that might otherwise be overlooked, thereby enhancing patient compliance preoperatively and postoperatively. Moreover, compared with the consent process delivered through a traditional web-based platform, which consists of static pages, VR can help patients clearly and quickly understand the details of their diagnosis and treatment because of its comprehensive, thorough, and customizable nature.

However, there are some limitations to the use of VR for obtaining patient consent. This is related to the accessibility of most health care facilities. Furthermore, considering aging populations, some older patients may be reticent to engage in technological innovations and may find it challenging or even frustrating. Similarly, the study conducted by Pandrangi et al.[18] stressed that most participants (79%) reported discomfort while using VR.

3.5. Three-dimensional models

Three-dimensional (3D) modeling technology can be used to create a physical and virtual model of a human body part, and it can replicate a specific individual patient based on preoperative information such as computed tomography or magnetic resonance imaging.[7] These models are constructed using additive manufacturing technologies, commonly referred to as 3D printers, in which the objects are built layer-by-layer. This can be applied to the consent process.[8,9] By using models to illustrate the affected organs and surrounding structures to patients, they can easily comprehend their disease condition and the surgical intervention required to treat the identified pathology. In a recent study, patients completed questionnaires before and after observing 3D models of kidneys before partial nephrectomy surgery, and the results showed a highly significant increase in the understanding of the patients in all categories considered ($p < 0.001$).[7] They were assessed for their understanding of kidney anatomy, tumor characteristics, surgery to be performed, and potential complications.

In addition to directly assessing the effectiveness of 3D printing, several studies have compared technologies to inform patients. Wake et al.[10] investigated the impact of 3D printing and augmented reality on patient education in the context of renal and prostate cancer. According to a Likert scale–based survey, patients responded better to 3D printed models than to augmented reality-based approaches in terms of understanding the disease, size, location, and treatment plan. Moreover, in the smaller subgroup, the authors also compared patients' responses to 3D printed models to traditional magnetic resonance imaging, augmented reality, or 2-dimensional models displayed on a screen, and again declared results emphasizing the superiority of 3D printed models over nonpalpable technologies.

In addition to patients, surgical trainees and attending surgeons also benefit from the use of 3D models.[8] Scott et al.[7] showed that 3 urology residents, 1 fellow, and 6 attending surgeons benefited from using all created models, as these enhanced their surgical planning and improved their knowledge of the intervention. Both residents and fellows noticed an improvement in confidence after communicating with the models ($p < 0.001$). Similarly, improved understanding was reported by the attending surgeons ($t = 3.246$; $df = 95$, $p < 0.01$).

4. Quality of information provided by tools

The potential usefulness of these tools is generally judged based on their success in conveying technical and medical facts to a wider population.[26] Health literacy among patients is a key factor to consider during the development of materials and tools to aid IC. A systematic review of patient health literacy found that most documents had a reading level beyond that of most patients.[1] In a study by Utz et al.,[26] approximately 60% of patients who underwent urological surgery were shown to possess minimal understanding of urological surgery, sometimes resulting in dissatisfaction and mistrust. In addition, multimedia, such as videos and animations, are highly recommended when teaching patients because they have been found to improve their understanding. When multimedia-supported IC materials were designed and implemented, Decker et al.[27] found that time consumption by patients was optimized, whereas patient satisfaction, confidence, and information gained were not negatively affected. These tools simplify complex surgical processes.[28] However, it is crucial to ensure that all multimedia formats are viewed by patients without technological competence.

Research has shown that when information is provided in an easily understandable format, patients struggle less when making decisions regarding surgery. For example, Sullivan et al.[12] found that the use of multimedia to provide IC enhances the quality of the information provided and shortens the amount of time taken to consult patients while simultaneously ensuring that patients fully understand that they are being told and are satisfied with the process. This study's finding indicates that if the information supplied is more precise and better structured, the consent process is quicker but still effective enough to obtain the necessary information across patients.[12] One means of improving readability has been the use of large language models, a form of AI that has gained popularity in the health care setting.[29] Studies have reported their use to either improve the readability of existing patient information leaflets or generate new materials for patient education.[30] However, it seems that at present, current platforms such as ChatGPT-4, PaLM 2 (Google Bard) and Llama 2 (Meta) still require health professionals to provide editing to improve accuracy.[31]

5. Social media

Social media has emerged as a popular channel for disseminating medical information and a means through which medical professionals and patients can share information and personal experiences.[32] However, misinformation contributes to confusion due to fake material that distorts the population's understanding of medical procedures and other treatments.[33] Ensuring that the information posted on these platforms is accurate and supported by evidence is a priority because many patients rely on these information sources. Misinformation on SoMe platforms poses a significant risk to patient consent, as it may mislead patients regarding the nature and specifics of medical procedures. A recent evaluation of TikTok videos on vasectomy revealed that 23% contained wholly incorrect basic medical information about the procedure.[19] Haack et al.[11] found that such misinformation patients can confuse and frighten patients, impairing their decision-making abilities. Consequently, some patients may agree to procedures based on misleading information, leading to inadequately managed patient expectations, whereas others may refuse necessary treatments due to irrational fears.

Controversies exist regarding consent to images and videos of surgeries on SoMe as well as privacy, ethics, and probability issues. As Cocci et al.[34] highlighted, patients can agree to have these recordings taken without fully understanding the extent of their exposure to the Internet. Furthermore, the presentation of surgical operations on SoMe platforms is likely to be without detail to a lay audience, and this is likely to promote the creation of hasty conclusions with misperceptions and often self-promotion from the medical community.[20] In a review of Instagram videos of endourological procedures, 97% had no statements regarding the consent gained.[35]

Ethical issues and recommendations regarding the use of SoMe among surgeons are centered on patient privacy, consent, and information sharing. Core recommendations do exist from international urology guideline groups regarding online professionalism and SoMe use.[36,37]

Some significant issues in seeking appropriate consent for images and videos posted on SoMe platforms include that patients do not fully understand what it means for their medical images to be posted in these areas.[38] Thus, it may be considered that their consent was inadequate, or that they did not provide consent initially. Patient privacy can easily be compromised due to the instantaneous sharing capacity of such content.[24,34] The media shared

on SoMe platforms cannot be eliminated completely.[39] Patient identification and subsequent legal complaints against individual clinicians breach the General Data Protection Regulation. There are also documented cases of doctors losing their medical licenses owing to inappropriate sharing of patient information on SoMe.

6. Existing tools from international societies

Although future developments in the consent process are anticipated, it is important to note that many of the different international urology societies have tools that are currently available. This includes the British Association of Urological Surgeons information leaflets that undergo revision every 3 years (https://www.baus.org.uk/patients/information_leaflets/). Animation videos are also available on the European Association of Urology website, which can be used to guide patients through the surgeries they will undergo (https://patients.uroweb.org/). The American Urological Association provides a wide range of educational materials to patients, which are available in numerous languages (https://www.auanet.org/meetings-and-education/educational-programs/patient-education).

7. Potential future developments

The concepts under consideration include the use of AI for the entire consent process.[40] Prototypes have been created in various research setting.[41] Although it seems feasible to use AI in such a delegated role, it is an area of controversy given the potential for ethical issues surrounding it. Future tools will likely build on the use of interactive interventions, whereby the information given is not passive, such as patient information leaflets. An example in clinical practice is the interactive decision aid tool developed by Bouhadana et al.[42] for benign prostate hyperplasia surgery. There is also increased attention toward including the perspectives of not only surgeons but also other health care professionals involved in operative care to ensure that the elements are not overlooked.[43] Parallel to these developments is the application of machine learning and predictive nomograms to generate tailored risk assessments for individual patients and the potential for complications during surgery. Therefore, surgeons can inform patients more accurately during the consent process.[44] For all new tools introduced, it is important to note that they must be adapted to the legislation of each country where they are being employed.

8. The need for an individualized approach

Finally, when considering whether such tools can be implemented in clinical practice, they should be tailored to the individual needs of the patient, as one approach does not fit all. Furthermore, for complex cases, a face-to-face approach represents the most suitable setting.

9. Conclusions

IC is a critical component of urologic care. Modern tools can complement this process, improve patient quality, and maintain patient satisfaction. Further dissemination and wider availability of these tools are anticipated. Future aid is likely to advance this field even more, and perhaps, there is a role for multimodality consent with a mixture of these tools.

Acknowledgments

None.

Statement of ethics

Not applicable.

Conflicts of interest statement

PJ is an editorial board member of Current Urology, confirms no involvement in any stage of this article's peer-review process, ensuring unbiased editorial decision-making. This article was accepted after normal external review. The other authors declare that they have no conflits of interest.

Artificial intelligence in the form of ChatGPT has been used to edit parts of the language in this submission.

Funding source

None.

Author contributions

None.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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How to cite this article: Ogbodo E, Talyshinskii A, Moen CA, Emiliani E, Somani BK, Tzelves L, Beisland C, Juliebø-Jones P. Patient consent in the modern era: Novel tools and practical considerations in urology. *Curr Urol* 2025;19(4):235–240. doi: 10.1097/CU9.0000000000000282