39 Artificial Intelligence and Multimedia Communication in Surgical Patient Education

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39.1	Introduction	2
39.2	Legal basis of the patient declaration	3
39.2.1	The "Informed Consent"	3
39.2.2	Requirements for effective information	4
39.2.3	Implementation of effective information	7
39.3	Artificial intelligence (AI) and the doctor-patient relationship	8
39.3.1	Different aspects of Al	8
39.3.2	The role of explainability and its impact on the doctor-patient re- lationship	9
39.3.3	Ethical considerations	9
39.3.4	Examples of the use of AI-based systems that can be helpful for patient education in surgery	11
39.4	Multimedia educational material	12
39.4.1	Film sequences	12
39.4.2	Internet-based educational tools	12
39.4.3	Interactive educational tools	13
39.5	Previous areas of application (examples)	15
39.5.1	Plastic surgery	15
39.5.2	Cholecystectomy	16
39.5.3	Further examples	20
39.6	Key results	21
39.7	CAVE	22
	References	23

You should be a person first and foremost and then a doctor. Voltaire (1694-1778)

39.1 Introduction

An upcoming operation or a comparatively intensive medical procedure is usually associated with considerable tension and uncertainty for patients. This uncertainty might be caused by the imminent medical measure itself. Moreover, fears regarding the illness that makes the procedure necessary in the first place and a possibly unfavourable course post operation further add to this uncertainty. From a legal perspective, patients who have to undergo an operation have the right to be informed by the surgeon or another sufficiently qualified doctor about the necessity of the procedure, possible alternatives and the risks associated with the operation (Weidenkaff 2013). If the doctor fails to provide information, an intervention in physical integrity—which is necessarily associated with an operation—constitutes bodily harm and makes the doctor liable to prosecution. The doctor's duty to provide information can only be limited or waived in cases of particular urgency (BGH 2005, Spickhoff 2013).

The patient's right to be informed by a doctor not only includes the fact that information is provided at all, but also that this information is provided in a form that is comprehensible for the patient in question. Therefore, a lecture full of medical terminology or an information sheet without any further explanations or the possibility to ask questions are not useful. Multimedia information tools might be helpful in the context of providing information. These tools can include interactive videos, animations, and virtual simulations that help explain complex medical concepts and procedures. They can enhance patient understanding and engagement by providing visual and auditory information that complements traditional verbal and written explanations. By using a variety of media, the main aspects of the upcoming procedure can be presented to the patient in an understandable way.

Individual studies carried out to date indicate that multimedia information procedures can increase patient satisfaction and acceptance of a procedure. One argument put forward is that patients can often use multimedia tools with no time limit. Patients all understand information at a different speed, and multimedia tools ensure that they can view and review the information at their own discretion until they have fully comprehended it. For doctors, the use of multimedia tools might be associated with time savings and thus more time for other medical activities (Klima et al. 2005). From a legal point of view, however, multimedia

A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence - 2

techniques can only support the doctor in fulfilling his duty to provide information, but they can never fully replace him in this process because of the need for personal contact.

Studies on the effects of multimedia patient education are subject to the proviso that patients usually do not come to a hospital uninformed to have an operation performed. As a rule, an operation is preceded by a referral from a general practitioner (GP) or specialist, during which the patient has already been informed about the reason for and the desired effects of the procedure as well as about possible complications. Particularly in the case of referral by a GP, it can be assumed that the GP has had far more time to inform the patient than the doctor working in the hospital setting. Patients who have been informed accordingly may have a lesser need for information than other patients, meaning that the demand for multimedia information techniques may also be smaller. This assumption is supported by the results of a study published in 2017 on the influence of multimedia education techniques on patient satisfaction. This study found that the satisfaction does not appear to be influenced by web-based education tools (Brandel et al. 2017). However, the study only included patients who had undergone cosmetic surgery. In the case of procedures that are not medically necessary and were actively selected by the patient, it can be assumed that patients obtain comprehensive information beforehand anyway, usually online (e.g. www.bzga.de). Consequently, they need less information from the actual surgeon than patients who are undergoing other types of surgery.

39.2 Legal basis of patient information

39.2.1 The "Informed Consent"

Patients and doctors evaluate information about an upcoming procedure from two completely different perspectives: While the patient may hope that it will provide a basis for deciding whether to have a particular procedure carried out at all, or at least to obtain reliable information about its hoped-for positive and conceivable negative effects, the doctor fulfils a central professional obligation. Since the Patients' Rights Act came into force in 2013, the sharing of information has been regulated in Section 630e of the German Civil Code (BGB). The central aim of providing information is to enable patients to exercise their constitutionally guaranteed right to self-determination (Spickhoff 2015). To be able to execute this right, patients need information about the reason, the type, the procedure, the expected consequences and, above all, the risks of the intervention. The failure to provide information about risks usually plays a decisive role in liability law disputes.

Only an appropriately informed patient is legally capable of giving consent. The concepts of information and consent must, therefore, always be considered together. This connection is reflected in the term "informed consent", which is often used to describe the requirements for legally required information. A doctor who performs an intervention without properly informing the patient beforehand is not only in breach of a treatment contract concluded with the patient, but is also liable to prosecution for bodily harm under Section 223 of the German Criminal Code (StGB).

39.2.2 Requirements for effective information

The Patient Rights Act of 2013 was the first comprehensive legal regulation describing the duty of doctors to provide information. The regulations in force since then also directly affect the framework within which multimedia patient information is permissible at all. Specifically, Section 630e (2) of the German Civil Code (BGB) stipulates the following requirements for effective information:

Person authorised to provide information

The information must be provided either by the attending physician themselves or by a person who, according to their training, would have the necessary qualifications to carry out the respective procedure themselves. In the case of operations, this is invariably a doctor. However, the obligation to provide information is limited to the doctor's own speciality, meaning that several doctors may have to be involved in providing information (Katzenmeier 2004: 34, 37). In practice, the most common example of this is the provision of information by both the surgeon and the anaesthetist in the case of an upcoming operation for which anaesthesia is required. The patient is, therefore, usually informed by at least two doctors, explaining different aspects of the procedure. The duty to inform is a personal duty of a doctor. As mentioned in the intro-

A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence - 4

duction, doctors can, therefore, not use multimedia tools *instead* of providing information themselves.

Supplementary consultation of documents

However, the provision of Section 630e (2) BGB expressly allows the doctor to refer to documents "*which the patient receives in text form*". In its previous case law, the BGH assumes that these are *written* documents (BGH 2000). This case law relates particularly to the forms and leaflets widely used in everyday hospital practice. These may only be used for preparatory and supportive purposes. The reason for this is, on the one hand, that the doctor is obliged to inform the patient individually with regard to their specific state of health and the risks involved in the procedure. On the other hand, the admissibility of information sheets and other forms as aids to medical information is limited by the fact that the doctor is obliged to ensure that the patient has understood the information (Gödicke 2008: 352ff.).

Permissibility of the use of multimedia tools

According to the wording of the law, multimedia information tools to support the medical consultation are inadmissible as they are not written documents. Nevertheless, it can be assumed that, contrary to the wording of the law, the doctor may also use multimedia tools. This is due to the fact that the physician is generally responsible for choosing the specific type and manner of information (Rixen et al. 2003). For this reason, the legislator has only regulated individual aspects of information in order not to unnecessarily limit the doctor's freedom of choice with regard to the appropriate information procedure. For this reason, the doctor may also use multimedia tools to provide information, provided that these are only used to supplement the verbal explanation and are discussed in detail with the patient. Even when using multimedia tools, the doctor must ensure that the patient has understood the statements relating to the procedure. A reference by the doctor such as "You can find all the details on the Internet" is inadmissible in any case, even if the patient indicates that they have already obtained information about the procedure from generally accessible sources (e.g. the Internet). In the latter case - which is becoming increasingly common in

medical practice - the doctor is obliged to establish whether the patient has correctly understood generally accessible information and related it to their own illness and the upcoming procedure. Determining and, if necessary, correcting the patient's false expectations and ideas is also part of the doctor's duty to inform the patient.

Quality of education

If the doctor uses multimedia tools to support his information, he must pay close attention to their content and determine whether they are suitable for the individual patient. This follows from the principle that the doctor must adapt the content of the information to both the type of procedure and the individual character of the patient. For example, in the case of standard surgical procedures for which there is a medical indication, the information provided must be truthful and comprehensive but as *gentle* as possible. This does not mean that the procedure and its conceivable consequences should be trivialised or that risks should be concealed. However, the doctor may take into account the consequences of the patient's refusal in the case of a medically necessary procedure. The situation is completely different for procedures that are not medically necessary, in particular cosmetic surgery. In these cases, the doctor must provide as *much* information as possible and also discuss rare risks in detail (Spickhoff 2013).

These principles also apply to multimedia tools and the information generated by AI used to support medical information. The advantages of multimedia tools include improved comprehension and retention of medical information, as patients can visualize the content and interact with it. Additionally, these tools can cater to various learning styles and break down complex information into more digestible formats, leading to better patient engagement and informed decision-making. It would be inadmissible to provide the patient with a trivialising presentation of a cosmetic surgery procedure in which only examples of the success of the procedure are shown. However, in commercially oriented cosmetic surgery settings, it is doubtful that doctors would use films, for example, to show patients what they might look like if a procedure fails.

Duty of consideration during the clarification

Multimedia techniques used by the doctor to support the information he is obliged to provide must present the same content about which the doctor is obliged to inform. However, particular caution must be exercised when using multimedia information methods if the patient has little or no capacity to cope due to medical or psychological reasons. A doctor always has to weigh his own liability risk against the right level and amount of information for the individual patient. In this case, information that is too ruthless can cause serious psychological and health damage to the patient and can thereby itself constitute bodily harm (Katzenmeier, Vogt 2014). This applies in particular to information that can lead to considerable psychological stress for the patient in specific individual cases. The doctor also has a fundamental duty to provide information in these cases; however, care must be taken to ensure that the patient's particular individual sensitivity is not thwarted by the fact that multimedia information materials go into detail about issues that the doctor, in accordance with their duty of care, should only confront the patient with to a limited extent or only in a particularly gentle manner. In general, the doctor must ensure that the patient is not "overloaded" with too much specialised medical knowledge that is not necessary for the specific explanation. This also applies to the use of multimedia information techniques.

39.2.3 Implementation of effective information

Since the Patient Rights Act 2013, the provision of *comprehensible* information has also been one of the doctor's legal obligations in accordance with Section 630e (2) BGB. A doctor must ensure that patients are able to physically and cognitively take in the information presented. Firstly, this means that the doctor must take a patient's comprehension difficulties into account. For example, for patients with little or no knowledge of the German language, an interpreter must be called in to support. Relatives of the patient or hospital staff can also be used for this purpose (KG 2009). This principle also applies if the doctor makes use of written or multimedia means to support his explanatory activities. It would be inadmissible to provide a patient who clearly does not have a sufficient command of the German language with multimedia in-

formation tools if these also contain spoken explanations. One permissible way to solve this issue would be to only use images or instruments without a linguistic level.

The doctor must also consider whether the patient has impaired hearing or vision. In case of doubt, essential information must be communicated in a way that can be grasped and understood by the patient. This may mean that certain multimedia information tools cannot be used. This also applies if the patient is obviously unable to operate devices for communicating multimedia content. If the doctor wants to use these tools, it's their obligation to ensure that the patient is able to comprehend the information through them. When ensuring that all requirements are complied with, the use of multimedia techniques will save time only in certain cases, namely those where the patient is able to both physically and cognitively comprehend the presented information without additional assistance.

39.3 Artificial intelligence (AI) and the doctor-patient relationship

39.3.1 Different aspects of AI

In addition to the multimedia tools described above, artificial intelligence (AI) is increasingly used for surgical patient education. AI penetrates more and more areas of our everyday life, so this is true for the field of medicine as well. It can broadly be defined as the science and engineering of building intelligent machines. In medicine, it is applied and used in a broad range of tools (e.g. genomics, some surgical robotics) and for a variety of purposes (e.g. precision diagnostics, precision therapeutics). The range of techniques that fall under this term is constantly evolving; branches such as machine learning — including neural networks, reinforcement learning and deep learning — rule-based expert systems, and computer vision have shown great potential in healthcare.

Great hopes are placed on AI technology to improve all aspects of healthcare, and there is hope that it can save the doctor's valuable time. Ideally, this saved time can be used to improve the doctor-patient relationships. Another hope is that patients can use AI to better inform themselves about their illness and treatment methods.

A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence - 8

A literature review conducted by Sauerbrei et al. analyzed the impact of AI on the person-centered, doctor-patient relationship (Sauerbrei, Kerasidou et al. 2023). The review included 45 studies published between 2014 and 2021, and the results show that AI has the potential to disrupt person-centered doctor-patient relationships. On the one hand, AI tools might support the practice of shared decision-making by increasing patient autonomy. On the other hand, AI tools could create a new form of paternalism and could harm shared decision-making due to their lack of value plurality. Finally, AI tools have the potential to improve the practice of empathetic care by freeing up time for meaningful and empathetic doctor-patient interaction.

39.3.2 The role of explainability and its impact on the doctorpatient relationship

AI tools can be seen as a new "third party" in the two-way doctorpatient relationship. Just as the doctor-patient relationship is founded on trust (Chin 2001), patients and doctors alike must be able to develop a trust relationship with the AI tool they are using. Creating trust is a complex process, and it requires the demonstration of trustworthiness. One way of doing this is to indicate reliability. In the case of AI, this might require features such as explainability, validity and freedom from algorithmic bias as well as clear pathways of accountability (Kerasidou 2020).

The literature (Sauerbrei, Kerasidou et al. 2023) suggests that solutions to this challenge are:

- ensuring that AI systems retain an assistive role only in clinical encounters and
- adapting medical education to ensure future doctors are prepared for an AI-assisted work environment.

39.3.3 Ethical considerations

Arguably, the medical environment is on the verge of a dramatic transformation as the use of artificial intelligence evolves quickly. With the inevitable shift toward AI in health care delivery, there are concerns around its implementation, including ethics, privacy, data representation and the potential for eliminating the need for doctors. However, AI cannot replicate a physician's knowledge and understanding of the patient as a person and the conditions in which he or she lives, so the last concern is likely unfounded.

Recently, artificial intelligence-driven chatbots have become mainstream, allowing patients to engage with interfaces that supply convincing, human-like responses to prompts. ChatGPT (OpenAI), a recently developed AI-based chat technology, is one such application that has garnered rapid growth in popularity (Mika, Martin et al. 2023).

Wang et al. (Wang, Liu et al. 2023) discussed the ethical problems which may arise when patients ask tools like ChatGPT instead of their physician. Legal ethics concerns arise from the unclear allocation of responsibility when patient harm occurs and from potential breaches in patient privacy due to data collection. Clear rules and legal boundaries are needed to properly allocate liability and protect users.

Lorenzini et al. have analyzed the influence of AI-based clinical decision support systems (CDSS) on the doctor-patient relationship and discussed the ethical implications (Lorenzini, Arbelaez Ossa et al. 2023). They concluded that the introduction of AI-based CDSS in the shared decision-making (SDM) alter the doctor-patient relationship. This will also involve a paradigm shift: while SDM may not vary, the fundamental relationship that lies at their core will. The introduction of AI shifts the medical relationship paradigm to a new form of SDM that is shared between AI, doctors, and patients. Eventually, this collaboration could result in better care.

Further issues may arise through an overreliance on artificial intelligence. Transparency and disclosure of AI-generated content are critical to ensure integrity. Algorithmic ethics raise concerns about algorithmic bias, responsibility, transparency and explainability as well as about validation and evaluation. Information ethics include data bias, validity, and effectiveness. Biased training data can lead to biased output, and an overreliance on ChatGPT can reduce patient adherence and encourage self-diagnosis (Wang, Liu et al. 2023).

39.3.4 Examples of the use of Al-based systems that can be helpful for patient education in surgery

Artificial Intelligence to Improve Patient Understanding of Radiology Reports (Amin et al. 2023)

Diagnostic imaging reports are generally written with a target audience of other providers. Such reports are mostly incomprehensible for patients. Consequently, many patients have requested reports to be conveyed in language accessible to them. Numerous studies have shown that improving patient understanding of their condition results in better outcomes, so aiding comprehension of imaging reports is essential. New natural language processing technologies and large language models can potentially improve patients' understanding of their imaging reports.

Shared Decision-Making for Knee Replacement Surgery (Gould et al. 2023)

The use of artificial intelligence in decision-making around knee replacement surgery is increasing, and this technology promises to improve the prediction of patient outcomes. A study from Gould et al. analyzed the participants' understanding of AI and their opinions on its use in shared clinical decision-making. The results showed that patients who underwent knee replacement surgery had varied levels of familiarity with AI and diverse conceptualizations of its definitions and capabilities. One finding shows that educating patients about AI through nontechnical explanations and illustrative scenarios can help inform their decision to use it for risk prediction in the shared decision-making process with their surgeon. These findings could be used in the process of developing a questionnaire to ascertain the patients' views on and acceptance of AI in shared clinical decision-making.

Assessing ChatGPT Responses to Common Patient Questions Regarding Total Hip Arthroplasty (Mika et al. 2023)

Patients today have access to numerous information resources on common orthopedic procedures before ever presenting for a clinical evaluation. Given the likelihood that patients may soon call on AI-based technology for preoperative education, Mika et al. want to determine whether ChatGPT can appropriately answer frequently asked questions regarding total hip arthroplasty. The results showed that the chatbot effectively provided evidence-based responses to questions commonly asked by patients prior to this operation. The chatbot presented information in a way that most patients would be able to understand. The authors conclude that this resource may serve as a valuable clinical tool for patient education and understanding prior to orthopedic consultation in the future.

In conclusion, while AI-based systems have the potential to improve patients' understanding of the illness and the planned therapy, it is important to ensure that its implementation is aligned with the values underlying person-centered care.

39.4 Multimedia educational material

39.4.1 Film sequences

Playing films showing the upcoming procedure is particularly suitable as supporting medical information when the technical procedure of an operation needs to be explained to patients. As early as 2005, Rossi et al. used a video showing the procedure in detail as part of the medical explanation before an arthroscopy of the knee joint. The information contained in the film was then discussed during the consultation (Rossi et al. 2005). In 2015, Hoppe et al. used a six-minute video to support information prior to knee arthroscopy. The aim here was to make it easier for patients to understand the procedure (Hoppe et al. 2014). Knee arthroscopy can usually be performed under regional anaesthesia without a general anaesthetic. In the preparatory film, the patient learns what they will see during their own operation. Showing film sequences is, therefore, particularly useful to prepare the patient for the impressions they will also have during the procedure itself if they do not opt for a general anaesthetic.

39.4.2 Internet-based educational tools

Other approaches to multimedia information go much further and attempt to provide patients with knowledge of the anatomical, pathologi-

A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence - 12

cal and surgical basics of the procedure before the operation. Webbased tools, which are offered in full before the medical consultation, are particularly suitable for this purpose (Yin et al. 2015). Even at a first glance, however, it is clear that such programmes are not suitable for all patients and for all types of surgery.

Yin et al. conducted their study on internet-based tools with patients who had undergone knee surgery. Such procedures may be associated with considerable pain and frequent complications, but they differ from operations with potentially life-threatening complications or a lifethreatening illness as an indication for surgery. An early German study on multimedia patient information included patients who had to undergo orthopaedic or trauma surgery and a blood transfusion (Klima et al. 2005). Taking into consideration the principle of gentle information discussed above, it appears questionable whether the physician may expose patients to a comprehensive multimedia presentation of their illness and the details of the forthcoming operation in case of lifethreatening conditions or operations.

The multimedia information tools mentioned here do not differ from written information material or film sequences as they are all based on a unidirectional transfer of knowledge. The only difference is that the patient can choose between a variety of prepared information or the type of media used. For example, the web-based tool used by Yin et al. (2015) consists of a twenty-minute sequence containing content specified by the investigators. In this respect, there is no conceptual difference to the presentation of film sequences. The only difference lies in the preparation of the material, which is made available to the patient before the operation.

39.4.3 Interactive educational tools

Educational tools are interactive if the patient can influence the way in which knowledge is conveyed or at least the speed at which it is conveyed. In this sense, tools in which the patient can control the speed of the knowledge imparted or decide to have certain content repeated are considered interactive. Modern educational tools enable the patient to influence the form of knowledge transfer at any time. The success of the programme can be continuously monitored by means of control questions that the patient must answer before continuing the presentation. These control questions can, for example, offer several options such as

- I have understood;
- I need additional information;
- please repeat;
- I need a consultation with a doctor.

A significant advantage compared to film sequences or non-interactive multimedia tools is that the patient's attention is constantly required. In addition, the use of virtual worlds and the associated immersion can potentially support and facilitate understanding. Such a virtual learning environment was created by Kleinert et al. (2016), among others, in order to be able to interactively convey teaching content and clinical pictures to medical students without causing harm to the patient as a result of incorrect decisions/judgements by the student.

The following screen excerpts are taken from the interactive learning programme by Kleinert et al. (2016):



Fig. 39.1: Screen excerpts from the interactive learning programme from Kleinert et al. 2016

Other tools for interactive patient education have been developed by the company ACTO for clinical pictures and treatment procedures, such as glaucoma, cataracts, excimer lasers (LASIK) and intravitreal injections. The on-screen dialogue can also be printed so that patients can read the information provided. In addition, the tools can be designed for patients with eye diseases who are unable to read or can only read to a limited extent due to their illness. For these patients, the information is then conveyed through speech or visual instruments appropriate to the patients' reading ability.

39.5 Previous areas of application

39.5.1 Plastic surgery

Investigation order

In a study conducted in 2017, Brandel et al. used a web-based tool to provide a total of 65 patients who had undergone plastic surgery on the breast or abdominal areas with comprehensive information on the specific requirements and on conceivable risks of the procedure. The 65 patients were divided into different groups that received either conventional or web-based information (Brandel et al. 2017).

Test result

Brandel et al. (2017) came to the conclusion that the additional information provided to patients had no influence on their overall satisfaction with the preoperative information. This result was independent of the patients' familiarity with modern technologies and their specific experience with web-based tools. Belonging to a certain educational level did not influence the result either.

Valuation

The reason for the results may be that the patients included in the study had already received comprehensive information so that no further information was required. However, the type of surgery included in the study may also play a significant role in influencing the results. The patients underwent either breast augmentation, reconstruction or abdominoplasty. Such procedures are generally not medically indicated. Therefore, the decision in favour of such an operation lies solely with the patient, who is usually fully informed about the procedure and the conceivable risks in advance of the decision, meaning that the need for information pre-operation is lesser than in the case of medically indicated procedures. It should not be overlooked that dissatisfaction with one's own aesthetic appearance often becomes a psychological burden for the patient. However, this does not negate the point made before: patients typically inform themselves thoroughly about all the advantages and disadvantages of the procedure before making a decision. Consequently, a web-based information tool does not offer these patients, who are usually comprehensively informed in advance, any improvement in information.

39.5.2 Cholecystectomy

Subject of investigation

A cholecystectomy is the surgical removal of the gallbladder. This is indicated if gallstones in the gallbladder itself or after the removal of a stone in the bile duct cause discomfort over a longer period of time. The condition is mainly characterised by pain in the upper right abdomen, colic or after a perforation of the gallbladder — an acute abdomen. With the exception of the latter case, the operation is planned so that affected patients can prepare for it. In most cases, the gallbladder is removed laparoscopically so that the entire abdominal wall does not need to be opened (McMahon et al. 2000).

Investigation order

Bollschweiler et al. (2008) investigated the influence of a multimedia information tool on the communication of information. The study included 76 patients, who received a planned laparoscopic cholecystectomy. The patients were divided into groups. One group received conventional information in the form of written information material and a discussion with a doctor, and one group additionally received a multimedia information programme. This tool contained a series of chapters that referred to the causes of the disease, alternative treatment methods and a description of the procedure itself. The time after the procedure and necessary aftercare measures were also addressed. The structure of the tool provided a gradual increase in the complexity of the content, illustrated primarily with images. Patients were able to select individual chapters and sub-chapters and view them several times. Forensically relevant content such as information about the risks of the procedure and existing alternatives had to be taken note of.

39. Artificial Intelligence and Multimedia Communication



Fig. 39.2: Screen excerpts from the multimedia information programme by Bollschweiler et al. 2008

Test results

With regard to the key point of patient satisfaction, which was measured using various instruments, there were no significant differences between the patients who received information with and those who received information without the help of the multimedia tool. 82% of patients who received conventional counselling and 83% of patients who received counselling using the tool were satisfied with the counselling overall. However, there were differences in the subgroups. In particular, patients who only had a compulsory school education benefited from the additional multimedia information. Regardless of education, patients felt significantly better informed about the procedure overall after using the tool, but not specifically about its risks. The authors rightly conclude from this that the doctors providing information should also take into account the level of education of the patients during the standard procedure (Bollschweiler et al. 2008: 208). The study also investigated the influence of the additional multimedia information tool on patients' preoperative anxiety. Overall, there was no significant difference between the two groups. However, there was a non-significant tendency for women to show slightly less cognitive anxiety before the procedure after learning with the multimedia tool. No such effect was observed in men (Bollschweiler et al. 2008: 209).

Valuation

When analysing the study results, it should be noted that only subjective parameters were assessed. It would also be conceivable to analyse objective parameters such as the complication rate or the length of stay in hospital; however, more complex interventions are more suitable as samples for this. According to the chosen study approach, the effect of the multimedia tool was compared to the effect of conventional information, meaning that the quality of the latter, which was assessed as very high overall, is the main reason why the multimedia tool was not able to lead to a significant improvement in the quality of information. This is supported, for example, by Stergiopoulou et al. (2006), who also investigated the influence of a multimedia tool on the quality of preoperative information before a laparoscopic cholecystectomy. Preoperative anxiety and post-operative pain were used as indicators in this study. In contrast to Bollschweiler et al., the authors came to the

A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence - 18

conclusion that a preoperative multimedia information tool had a significant influence on both factors investigated, which was explained in particular by the inadequate conventional information (Stergiopoulou et al. 2006). It can be concluded that the positive effect of a multimedia tool in patient education is particularly high when the conventional information is inadequate.

The results of Bollschweiler et al. (2008) may be falsified by the fact that the information provided in the study was particularly thorough so that the transferability of these results into practice appears questionable. It can be assumed that the quality of the communication of educational content using multimedia tools in practice also correlates with the commitment of the doctors involved. The tools that are offered should be self-explanatory; however, it is difficult to judge whether patients actually use them as intended without constantly monitoring this use. Both with and without the use of a multimedia educational tool, the success of the educational programme, therefore, depends significantly on the commitment of the medical staff involved.

As the study by Bollschweiler et al. shows, dedicated, conventional information tailored to the patient's respective understanding can fulfil the patient's need for information to a large extent so that an improvement through multimedia tools is hardly possible. Multimedia tools only add value when they are implemented and supported closely by medical staff. Consequently, the tools' main positive effect of saving the doctor time would actually negate their positive impact because the doctor needs to invest time also in guiding the patients through the tool and supporting with further questions.

Various studies have been conducted to optimise the consent process for laparoscopic cholecystectomy (LC). A Canadian prospective randomised trial investigated whether patients who had used an interactive digital module in addition to verbal education about the risks and benefits of LC had advantages for patients who had standard education. The results showed that the addition of a digital education platform to standard verbal consent significantly improves patients' early and delayed understanding of risks and benefits of LC in an acute care setting by Anood Alqaydi et al. (2024).

39.5.3 Further examples

Surgery of the paranasal sinuses

Siu et al. (2016) chose a different approach to the studies presented so far. The 50 patients included in the study, who all underwent sinus surgery, were shown a six-minute interactive presentation about the procedure and particularly its associated risks. In a comparison group, patients were informed in the conventional way: in writing and through a conversation with a doctor. The effect of the multimedia tool was measured by asking the patients immediately after the presentation and in a second survey after 3 to 4 weeks which risks of the procedure they remembered. There was a significant difference in the risks remembered by the patients immediately after the presentation of the tool, but there was no significant difference in those remembered in the later survey. In conclusion, the presentation of a multimedia tool immediately before giving consent for surgery increases the quality of informed consent, but the tool does not create a lasting understanding of the risks of the procedure. As an additional result, the authors found that 68% of the patients included in the study were in favour of integrating a multimedia tool into patient information (Siu et al. 2016).

Prostatectomy

In a study by Huber et al. (2013), patients who had to undergo radical removal of the prostate were offered a multimedia tool in addition to conventional information. Its effects were measured using various key points. Firstly, there was a significant difference in patient satisfaction. In the group using the tool, the score was 69%, while the score in the group that did not use the tool was only 52% (Huber et al. 2013). The multimedia tool had no influence on the duration of the subsequent medical consultations. It also did not influence the recall of the individual risks addressed in the multimedia presentation. Nevertheless, the overall knowledge conveyed about the procedure was higher among patients who had been informed using the tool. In contrast, there was no difference in terms of the patients' fear of the procedure or their willingness to make a decision. Irrespective of these results, the tool was rated positively; 74% of patients who had used it as part of the information process thought that the information was better than the conventional

A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence - 20

39. Artificial Intelligence and Multimedia Communication

information. It should be noted that this study relates to an operation that is usually based on a very serious medical condition.

Shoulder surgery

Hoppe et al. (2014) conducted a study of 40 patients who had undergone shoulder arthroscopy. This is a common but not vital procedure. Some of the patients were shown a ten-minute video explaining how the operation would be performed and what possible risks and consequences might be associated with it. The patients who had seen the explanatory video were of the opinion that they had received better information overall; however, there were no significant differences in terms of patient satisfaction. Patient satisfaction was measured using a questionnaire developed by the authors. The authors recommend an information tool in addition to conventional information but point out - in basic agreement with all other authors and the legal situation - that it cannot replace the information provided by the doctors themselves.

Hepatectomy

Hepatocellular carcinoma (HCC) is a significant health concern, and the complexity of liver anatomy poses challenges in conveying radiologic findings and surgical plans to patients. Yang et al. (2024) performed a prospective randomized trial to evaluate the impact of a virtual reality (VR) education program on anxiety and knowledge in HCC patients undergoing hepatic resection. The results showed that the VR education program significantly improved knowledge and reduced anxiety among HCC patients when compared to conventional methods. This study suggests that VR can be a valuable tool in patient education, enhancing comprehension and alleviating presurgical anxiety (Yang et al. 2024).

39.6 Key results

The overview of the areas of application of multimedia patient education and the studies carried out on this subject document that the topic has been of some scientific relevance for several years. However, the individual studies are at time difficult to compare as different measuring instruments are used and, in particular, different key points are defined. There is no consensus that multimedia tools increase the level of information and satisfaction of patients or reduce the fear of surgery, despite individual results that suggest this. Overall, studies recognize that multimedia tools can increase patient satisfaction, which may also be due to the special attention that patients have received in the context of clinical examinations. However, the ability to physically and cognitively access the presented information is key to ensuring that informed consent is possible. Even if there are no clear study results, it can be assumed that younger patients, in particular those who have experience with multimedia tools or the use of the Internet, respond well to such tools. According to individual studies, differences in the level of education influence the effect of the tools. However, Bollschweiler et al. (2008) rightly note that the result of medical information with or without a multimedia tool depends in particular on the commitment and empathy of the doctor providing the information. The latter aspect is also likely to play a significant role in the suitability of medical information to counteract preoperative anxiety. The effect of multimedia information tools is also likely to depend on the type of procedure or the underlying health impairment. For example, it is unlikely that additional information tools are effective for patients undergoing cosmetic surgery, as the patients in question regularly obtain comprehensive information, often on the internet, before deciding to undergo the procedure.

39.7 CAVE

- Medical counselling is a legal obligation that cannot be replaced by counselling tools.
- The information must be provided by the doctor in person. He or she may use multimedia or AI tools to prepare the consultation.
- It is questionable whether the use of these tools will save a significant amount of time in practice as the discussion of the contents of the tools, which is part of a proper explanation, also often requires a great deal of time.
- Although not all authors come to this conclusion, it can be assumed that multimedia tools increase patient satisfaction with the information process overall.
- The use of AI or multimedia information tools can be seen as a useful addition to the conventional educational process, but not as a replacement of it—not even a partial one.
- A. Koerfer, C. Albus (Eds.) (2025) Medical Communication Competence 22

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Further references on doctor-patient communication can be found in other topic-specific chapters and in the complete <u>bibliography</u> of the <u>handbook</u>.

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