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Use of online material in teaching general practice

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Abstract

I kurset på almen medicin ved Københavns Universitet optager de studerende video af deres konsultationer i almen praksis. Video konsultationer med skuespillere og praktiserende læger blev produceret for at understøtte undervisningen. Målet med dette studie var at evaluere effekten af at indføre konsultations-videos i den eksisterende undervisning. Sidste semester studerende (N=587) blev af universitet inddelt i seks grupper og en stigende mængde online materiale blev trinvis indført. Et spørgeskema og en test video målte ændringen i de studerendes evne til at identificere patient-centerede elementer i en test video før og efter kurset. Indførslen af videoklip øgede ikke de studerendes evne til dette. Derimod blev de studerende bedre til at evaluere det kliniske indhold i test video. At se konsultations videoklip før undervisningen med henblik på diskussion øger de studerendes forståelse af sygdomsbillede i almen praksis.

Engelsk abstract

In the general practice course at Copenhagen University, the students record videos of their consultations in general practice. Simulated video consultations were produced to support learning. The aim of this study was to evaluate the effect of adding simulated consultation videos to standard teaching. Final semester students (N=587) were assigned by the university to six groups and an increasing amount of learning material was stepwise applied. A questionnaire and a test video consultation measured the change in students' ability to identify patient-centered elements in a consultation pre- and post-course. Introducing simulated video consultations did not increase awareness of patient-centered elements but demonstrated increased skills in evaluating clinical topics. These findings conclude that watching simulated video consultation before lessons for discussion increases students understanding of the epidemiology of diseases in general practice.

Introduction

In the general practice course at Copenhagen University students are taught the patient-centered consultation model. This model divides the consultation into a patient's part, a doctor's part, and a common part. In the patient's part the patient tells the story of her/his illness. In the doctor's part, history-taking and clinical examination take place, and in the common part an agreement on diagnosis and plan are reached (Witt, 2003).

Learning to work in general practice is difficult for undergraduate medical students (Braverman et al., 2016). Patients in general practice present complex sets of symptoms and the epidemiology of diseases differs from hospital patients. The students are confronted with higher uncertainty in dealing with patients in general practice (Innes et al., 2005). For these reasons, transferring acquired clinical skills to consultations in general practice is a major challenge.

According to script theory, medical knowledge is bundled in the neocortex into information networks, called "illness scripts". They allow physicians to integrate new information with existing knowledge, to recognize similarities and differences, and to make a prognosis (Lubarsky et al., 2015). The scripts are updated and refined through experience and learning (Hailikari et al., 2008).

Teachers cannot simply transfer their collections of "illness scripts" into the minds of students. Instead, students need opportunities to develop and fine-tune their own illness scripts by seeing patients on their own. Observing doctor-patient encounters can also help students develop their own illness scripts. Therefore, introducing simulated consultation videos as an alternative to observing real consultations could be effective in creating new illness scripts, especially in a compressed study program with few clinical days. The video material should be viewed at home as a preparation for teaching sessions where the content of the video will be discussed. This makes the teaching more interactive and dynamic,-in a flipped classroom design.

A systemic review from 2017 included 46 articles about the effect of flipped classroom teaching and found these studies heterogenous and the effect questionable (Chen et al., 2017). A year later another systemic review and meta-analysis found 28 articles and a significant effect of flipped classroom teaching in health professions (Hew & Lo, 2018).

Analysis and discussion of video consultations recorded by the students in the general practice clinic has been used in small group teaching since 1991. In a new curriculum from Ghent University both videos with real patients and simulated patients were introduced (Deveugele et al., 2005).

A formal video case teaching program in pediatrics for learning and final assessment of medical students at Copenhagen University improved students' ability to assess the clinical content in video cases (Malon, 2014).

Simulated consultation videos were used in an online module about the motivational interview for undergraduate medical students. It improved their skills as confirmed in an OSCE examination and by their score in a self-efficacy questionnaire. (Kaltman et al., 2015).

Analyzing students' consultations recorded during their work in general practice is a major part of the course in general practice at Copenhagen University. Analysis and evaluation are complex skills rated high on Bloom's steps of learning (Adams, 2015). The students' ability to perform in a doctor's role in general practice is assessed in the final exam, where they present a video of their own consultation with a real patient.

The aim of the study was to explore the effect of adding online video consultations to a course in general practice, measured by the change in students' ability to evaluate a video consultation from general practice.

Methods

The design

The study was a survey involving a pre-and a post-course test on a video consultation using a questionnaire. The same test was used before and after the course and the change in number of correct answers was calculated. This design is often used in measuring teaching effectiveness.

The teaching

All students attending any of the twelve courses in general practice in 2013 and in spring 2014 at Copenhagen University (KU) were included in the study. Each course lasted five weeks and consisted of eight days of supervised clinical work as a doctor in a general practice clinic, video recording all consultations. These video cases with real patients were discussed in small group sessions at the university (20 hours in all) and feedback on student videos were given by a university teacher and peers.

The course is designed according to Kolb's experiential learning theory where a learning cycle consists of experience, reflection, concept formation, and experiment (Kolb & Kolb, 2005). In the general practice course, the students get experience from working in a general practice clinic, come back to university for feedback and reflect with peers, and try out new learning. In this study, simulated consultation videos that students should watch at home before class were added, accompanied by questions about general practice consultations (see Table 1). The patient-centered consultation model used in general practice was introduced in chunks to support the learning process.

Table 1. The course in general practice at Copenhagen university

Week	Clinical exam questions	Four video clips	Lectures	Days in general practice
1.	Fatigue Weight Loss Fever	None	Communication workshop The diagnostic process Screening	2
2.	Dizziness Syncope Falling trend Breathing problems	Focus on the patient's part in the consultation	General practice Pharmacotherapy Infections Chronic diseases The elderly patient	2
3.	Chest pain Acute abdominal pain Acute low back pain	Focus on the doctor's part in the consultation	Mental disorders, Functional disorders Prevention	2
4.	Tumors and local swellings Sleep disorders	Focus on the common part in the consultation	Evidence-based medicine	2
5.	Confusion Unexplained symptoms Functional disorders.	Focus on the end of the consultation	None	None

The evaluation: questionnaire and test video

Learning was evaluated by measuring changes in students' ability to identify communicative, clinical, and general elements (e.g., time used or interruptions) in the test video. All students completed a questionnaire after having seen the video before and after the course.

The DanSCORE questionnaire (Danish Structured Consultation Observation Registration and Evaluation) was constructed for research purposes by one of the authors (KW), based on the steps of a patient-centered consultation as described by Levenstein (Levenstein et al., 1986) and Brown (Brown et al., 1986) (Witt, 2016). This model is used in Danish general practice. The questionnaire has 33 items and is described in more detail previously (Jorgensen et al.., 2021). It has fifteen communication items, five clinical items, and thirteen general items. (See Supplementary Material 1).

The 15-minute test video showed a consultation between a general practitioner (GP) and an actor, who presents as an overworked middle-aged man with a headache (see Figure 1). The consultation was made to demonstrate the many aspects of consultations in general practi- ce and based on the bio-psycho-social illness model (Engel, 1977). The test video was placed on the Vimeo platform and streamed in a lecture about the general practice consultation model on the first day of the course. It was repeated in a lecture about the final exam the very last day of the course.

Figure 1. Screenshot from the test video. A middle-aged man with stress and headache and a general practitioner

The items of DanSCORE were filled immediately after watching the test video. Students were not allowed to talk while completing the paper questionnaire. Each student's answers before the course were linked to his or her answers after the course, without revealing student identity to the researchers. The result was scored with one point for each correct answer and none for incorrect answers; missing answers were treated as incorrect. Since the videos had a different number of correct answers, the top score depended on the test video shown. The data were entered into Microsoft Excel manually.

First, the teachers decided on what the correct answers for each video would be, but minor disagreement among the teachers existed. Therefore, the final decision of criterion standard for correct answers was made by the two first authors after a transcription and a conversation analysis (Forfatter, 2021).

Learning analytics

The number of students that watched the videos on the learning platform (hits) was calculated automatically and electronically. We could identify the total number of hits, but not the individual student. Some students might have accessed the videos several times and some students not at all. Students completing the mandatory analysis were not anonymous as the result could be found on the learning platform, but the data were only used to ensure that all students did the analysis.

Interventions

The intervention consisted of sixteen video clips, a full-length consultation video and a conversation analysis scheme on paper. The two first authors produced sixteen short, simulated consultation video clips with financial support from Copenhagen University. The clips lasted from 30 seconds to five minutes and showed patients with symptom presentations often seen in general practice (Table 2). All clips were placed on the digital learning platform at Copenhagen University, used for all communication between the university and students.

Table 2. The clinical content of the video clips used in the general practice course

Before group session week	Content of videos	Duration Min'/Sec"	Learning aim
2	Patient with stress I	4'21"	Stress in general practice. HEADACHE
	Young mother with pain in her joints	4´19"	Joint problems JOINT PAIN
	Headache I	4´30"	Headache in general practice. HEADACHE
	A satisfactory solution?	1´45"	Sick leave or not? Who decide if the patient is ill? DIZZINESS
3	Doctor and patient disagree	0´40"	About dizziness and the need for MR. DIZZINESS
	Young woman with a knee problem	2´47"	Knee problems KNEEPROBLEM
	Headache II	4´29"	Lousy doctor HEADACHE
	When an important thing is missing	1´30"	Doorknob question Rash on foot RASH
4	Patient with stress II	3´33"	An unfriendly doctor DIZZINESS
	What about a sick leave?	1´27"	A demanding patient ANXIETY
	A dizzy and demanding patient	5´36"	A demanding patient DIZZINESS
	An unacceptable solution	1´09"	Disagreement between patient/doctor STRESS
5	Patient with stress III	1´04"	Mutual understanding STRESS
	Missing the agreement on the topic for the consultation	0´35"	Doorknob question FOOTPROBLEM
	Young woman with arthralgia	3´14"	Lousy doctor JOINT PAIN
	A dizzy, demanding, and worried patient	4´08"	Mutual understanding DIZZINESS

Three actors presented symptoms like headache, dizziness, stress, anxiety, or joint pain. To make videos as authentic as possible, the actors presented history and symptoms they had experienced recently. The two first authors acted as GPs, being more or less patient-centered and varying their behavior to enhance the learning potential. They could be warm and emphatic or fail to listen properly to the patient.

Each clip was followed by questions about the patient-centered consultation method for reflection (see screenshot 2). The last four groups discussed clips in small group sessions at the university with peers and a teacher. Elements of the patient-centered consultation model were presented stepwise to enhance learning.

The clinical topics were discussed in small group sessions with focus on the epidemiology of diseases in general practice and emphasis on the bio-psycho-social model that is especially prominent in general practice.

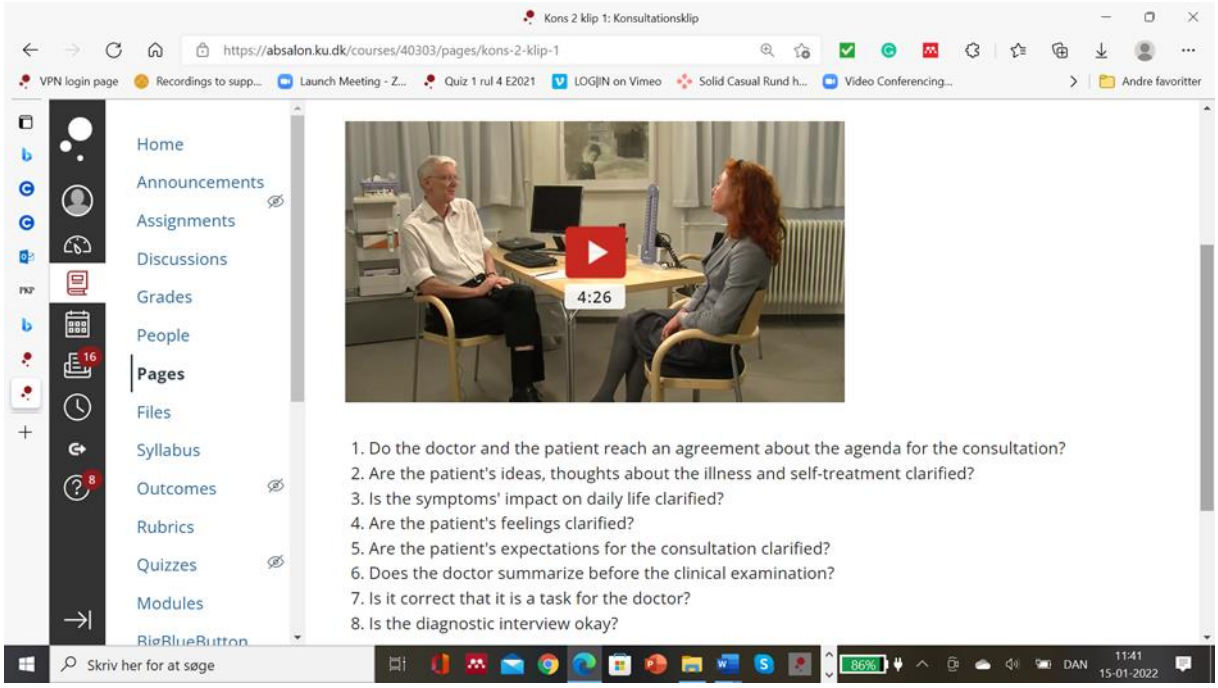

Figure 2. Woman with dizziness and anxiety. Screenshot

A full-length consultation of fifteen minutes between a trained GP and an actor meant for a mandatory conversation analysis was filmed. The actor was an anxious and stressed woman wishing for an MR-scan; her mother had recently died from metastatic cerebral tumors. Their answers were automatically transferred to a Microsoft Excel spreadsheet. This video analysis was made mandatory by the University because of many complaints about exam Students seemed to forget the importance of the patient's narrative in the patient's part of the consultation, where the patient comes directly from home without being seen by a health care worker. This narrative helps the doctor convert symptoms to diagnosis, and this is demonstrated in the video.

The 16 short clips were embedded on the learning platform. They were meant as preparation for group teaching sessions but could be analyzed by the students online any time during the course.

The conversation analysis timeline on paper (Logic and Chronology of a Consultation Scheme) was introduced in the small group teaching for students to use watching their own and other students' videos (see Supplementary Material 2).

The online teaching material

The teaching was supported by gradually increasing the amount of online teaching materials in the successive courses as follows:

1. The students in group I (*Control)* received the usual curriculum and provided a baseline.
2. Group II *(Access)* had access to 16 video clips and reflective questions.
3. The students in groups III-VI (*Teaching, Analysis, Mandatory and Pre-exam* groups) were asked to watch before each group session four selected video clips, representing different aspects of the patient-centered consultation for discussion with teachers and peers.
4. In group IV *(Analysis)* a written consultation analysis was added to teaching sessions to demonstrate the structure of consultations (see Supplementary Material 2).
5. In group V *(Mandatory)* a mandatory analysis of the fifteen-minute simulated online consultation video was added, without feedback to students.
6. In group VI *(Pre-exam)* five out of the 16 video clips were added for the students to test their analytic skills before the exam. This time they received immediate feedback on their answers.

Statistics

Effect size (ES) is a standardized measure of change often used in educational research. It can be used to directly compare different outcomes that may have different units, ranges, or variation. Effect sizes were calculated as the mean difference in the number of correct answers before and after the course divided by the standard deviation of the number of correct answers before the course. They were calculated for each of the three item groups separately, and for all items jointly. Calculated effect sizes of less than 0.20 were considered low and those over 0.80 high, as suggested by Sullivan and Feinn (Sullivan & Feinn, 2012).

The tendency to improve is inherently connected to level of knowledge present at baseline: students that already know everything cannot improve. Hence, improvement is to be assessed taking the baseline knowledge into account. This tendency was compared between groups with odds ratios (ORs) from a multilevel logistic regression model, as ORs are not dependent on the probability of a correct answer for an item. Here the probability of answering correctly to an item is modeled as dependent on the item and on the student with random effects, and as dependent on the test time point and the group as fixed effects. The model is parameterized so that a first set of ORs for the groups assesses pre-course differences in skill between the six groups, and a second set of ORs assesses differences in the tendency to increase in skill between the six groups over the course period.

In the second set, an OR=2 indicates that the odds for a correct answer on an item increase on average (over all items) with a factor 2; we use odds instead of probability here as OR is not dependent on the probability of a correct answer for an item, while a probability ratio is, and taking an average, would be wrong.

The differences in the use of video elements and in exam grades between the groups were assessed with ANOVA. The difference in the fraction of items answered between those that filled out both questionnaires and those that filled out only one of the questionnaires was analyzed with ANOVA.

Ethics

The study was carried out in accordance with relevant guidelines and regulations. The students were informed that the purpose of the study was evaluation of the teaching. The Danish Regional Health Research Ethics Committee was consulted, but no further approval was needed, as the study did not involve any kind of human intervention, excision of human tissue, or similar. The students' answers in the mandatory analysis were handled anonymously, as the number of answers only was compared to the number of participating students. The non-professional actors volunteered to participate and were informed verbally about the project.

Results

Table 3. Group characteristics, exam grades, and effect sizes

	Group I	Group II	Group III	Group IV	Group V	Group VI
	Control	Access	Teaching	Analysis	Mandatory	Pre-exam
	(n=88)	*(n=106)*	*(n=102)*	*(n=102)*	*(n=95)*	*(n=98)*
Female students/ male students n (%)	51(58)/ 37(42)	74(70)/ 32(30)	68(67)/ 34(33)	67(66)/ 35(34)	53(56)/ 42(44)	59(60)/ 39(40)
Completed both DanSCORE questionnaires, n (%)	69 (78)	74 (70)	71 (70)	52 (51)	76 (80)	66 (67)
Total use of video elements (n)	0	328	477	307	304	270
Use of video elements per student (n)	0	3.9	4.5	3.0	3.2	5.5
Use of video elements in teaching sessions (n)	0	8	8	6	6	6
Exam grade, n (%)						
Grade -3 or F	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Grade 0 or Fx	1 (1)	0 (0)	5 (5)	0 (0)	0 (0)	1 (1)
Grade 2 or E	2 (2)	3 (2)	0 (0)	0 (0)	1 (1)	2 (2)
Grade 4 or D	4 (5)	5 (4)	4 (4)	9 (9)	6 (6)	8 (8)
Grade 7 or C	19 (22)	25 (24)	22 (22)	22 (22)	13 (14)	16 (16)
Grade 10 or B	37 (42)	35 (33)	37 (36)	40 (39)	36 (38)	45 (46)
Grade 12 or A	25 (28)	38 (36)	34 (33)	31 (30)	39 (41)	26 (27)
Grade, mean (sd)	9.35 (2.64)	9.50 (2.62)	9.29 (3.03)	9.43 (2.64)	9.95 (2,0)	9.29 (3,0)
Effect size Communication items (items 1-7, 10, 14-20)	1,05 (0,12)	1,05 (0,12)	1,00 (0,12)	0,66 (0,14)	1,14 (0,11)	0,73 (0,12)
Effect size Clinical items (items 8, 11-13)	0,23 (0,12)	0,23 (0,12)	0,54 (0,12)	0,17 (0,14)	0,65 (0,11)	0,93 (0,12)
Effect size General items (items (21-33)	0,08 (0,12)	0,36 (0,12)	0,18 (0,12)	-0,06 (0,14)	0,11 (0,11)	0,08 (0,12)
Effect size All items (items 1-33)	0,46 (0,12)	0,81 (0,12)	0,76 (0,12)	0,35 (0,14)	0,82 (0,11)	0,78 (0,12)

Table 3 shows results from intervention groups. The highest effect sizes were observed in the communication items, varying effect sizes in the clinical items and generally lower effect sizes in the general items. A low effect size may reflect either the students already grasping an element of the patient-centered consultation upon entering the course so that there is not much room for improvement, or that the teaching is ineffective. An overall positive teaching effect was seen in all groups (average effect size for all groups 0.67).

The effect was highest in communication items (average ES 0.94). The effect size sum scores were measured for all DanSCORE items and each of the three item groups. The use of video elements per students seems to increase over the courses, but the effect is not significant.

In the final grades of students, 0 and -3 are failing grades. The mean grades were similar between groups (p-test for trend = 0.4314). The distribution of exam grades did not change significantly due to the intervention (p>0.4314). Results from the multilevel regression analysis for binary data are shown in Table 2.

Table 4. The tendency of answering correctly to an item compared between the six groups expressed as odds ratios (OR) from a multilevel logistic regression model

Item numbers	All items		Communication items		Clinical items		General items	
	1-33		1-7, 10, 14-20		8, 11-13		21-33	
	Odds	CI	Odds	CI	Odds	CI	Odds	CI
Group I (Control) before the course	1.57	1.12-2.19	1.00	0.63-1.58	3.59	1.07-12.03	2.15	1.34-3.44
Corresponds to probability:	0.61		0.50		0.78		0.68	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Group I (Control) increase over the course	1.39	1.21-1.58	1.65	1.37-2.00	1.26	0.81-1.94	1.16	0.93-1.46
Difference to Group 1 (Control) before the course*								
Group II (Access)	1.08	0.90-1.31	1.07	0.89-1.29	1.34	0.83-2.18	1.08	0.72-1.62
Group III (Teaching)	1.11	0.91-1.34	1.21	1.00-1.46	0.88	0.54-1.42	1.05	0.70-1.59
Group IV (Analysis)	1.17	0.95-1.44	1.39	1.13-1.70	0.98	0.58-1.65	0.99	0.64-1.55
Group V (Mandatory consultation analysis)	1.34	1.11-1.62	1.23	1.02-1.47	1.02	0.63-1.63	1.75	1.16-2.64
Group VI (Pre-exam)	1.13	0.93-1.37	0.88	0.73-1.06	1.00	0.61-1.62	1.77	1.16-2.69
Difference to Group 1 (Control) after the course**								
Group II (Access)	1.20	0.99-1.44	1.05	0.80-1.36	0.93	0.50-1.71	1.56	1.13-2.14
Group III (Teaching)	1.15	0.96-1.39	1.09	0.83-1.43	**2.03**	1.08-3.79	1.09	0.80-1.49
Group IV (Analysis)	0.89	0.73-1.09	0.94	0.70-1.26	**1.44**	0.74-2.82	0.80	0.57-1.13
Group V (Mandatory consultation analysis)	1.10	0.92-1.33	1.06	0.81-1.38	**1.80**	0.97-3.35	0.99	0.72-1.37
Group VI (Pre-exam)	1.04	0.86-1.26	0.91	0.69-1.19	**2.55**	1.32-4.91	0.96	0.69-1.34

Results from the multilevel regression analysis for binary data shows a tendency of students' clinical skills increasing in the latter intervention groups III-VI (Table 4, in bold). In these groups, the simulated consultation video clips were discussed in small group teaching.

Discussion

The general practice course aims at teaching students to perform and analyze the patient-centered consultation using a model reflecting general practice. In the teaching the following are emphasized: *agenda setting; exploring the patient's ideas and expectations for the consultation, function, and concerns; doctor's use of summarizing; aiming at mutual understanding; and safety-netting*. These

elements are derived from the early definition of the patient-centered model (Levenstein *et al.,* 1986) (Brown et al., 1986) and new to the students. The teaching seems to be successful, as the effect sizes are highest in the communication items, where most of the patient-centered elements belong.

A tendency towards improved skills in clinical topics was found in the four intervention groups which discussed the consultation clips in teaching sessions (group III-VI), demonstrated by the multilevel regression analysis. A multilevel logistic regression analysis is more explorative than ES, as it takes into consideration the students' tendency to increasing skills during the course.

The study was part of developing standard teaching, the curriculum was unchanged during the study period and the teachers were the same.

Discussion of results

This study aimed to measure the effect of gradually intensified online teaching elements, using the change in students' ability to evaluate a consultation in general practice from before to after course in calculating effect sizes. The results were compared with data for students having the usual course.

The short video consultation clips were to be watched at home before class. They were accompanied by questions about the patient-centered consultation model and in the first interventions group just meant for reflection. In the four last intervention groups, videos were to be discussed in teaching sessions at the university.

The effect of preparing for classes in this way is effective in retrieving previous knowledge and enhancing the students' self-directed learning (Hailikari et al., 2008) (Jdaitawi, 2019). The variation in previous knowledge is seen in single items and in the individual student's answer. Preparing for classes makes the teaching more interactive and dynamic (Lee & Kim, 2018) (HEW & LO, 2018). Face-to-face teaching time can be used more effectively, as the students arrive well prepared. Looking at effect sizes provides a possibility to find elements that need intensified teaching.

Students have changed over time. The medical students of today have grown up with internet access, need instructions in shorter segments (chunks) and are used to material delivered as videos and in interactive formats (Boysen et al., 2016)(Thalmann, M., Souza, A. S., & Oberauer, 2019).

The theoretically good idea of using a flipped classroom design was difficult to implement in our general practice course. This confirms findings in health science at KU (Thorell et al., 2015), so perhaps the university at that time failed to instruct the teachers and the students sufficiently in the use of this method.

A successful flipped classroom design requires that students are well prepared for the class and the teachers' encouragement. This has been improved in recent years by an effort from the Center for Online and Blended Learning at Copenhagen University and the number of articles about instructional design have increased the last years (Fatimah A Albrahim, 2020) (Abdullah Arslani, 2020).

Students might have found pre-class work too burdensome; for example Khanova observed online material to be overwhelming for medical students (Khanova et al., 2015). The low usage of additional videos and pre-examination tests can also indicate lack of students' time or interest.

In this study the teachers over time discussed fewer videos in the teaching sessions. Watching simulated consultations in small-group sessions can be tedious both for teachers and students, as compared to giving and receiving personal feedback on success in a professional role in students' own videos. This could explain the decline in use of videos in the teaching sessions. Nevertheless, it seems that discussion

of the videos in the teaching session had an effect on students' ability to evaluate clinical topics in general practice, even if the epidemiology in primary care was new to them.

The students nowadays are more used to preparing for class and using videos. Based on results from this study the current course is basically the same, and a consultation video of a student seeing a real patient is used as test video before and after the course. The simulated consultation videos are reduced from four to two clips, because they took up too much time in small group sessions. The pre-exam test is the same and the mandatory video analysis is now the post-course test.

Simulated or standardized patients (SPs), even if well-performing in their role as patient, cannot be as authentic as real patients. SPs are increasingly used in teaching because of the ethical and legal problems in using real patients. The three actors in this study were not professionals, but well known to the authors. They all three had a history of the clinical problem the presented in the videos.

The study was done when the use of online teaching materials was only beginning. The online materials might have been less than ideally designed for students. Questions about patient-centered consultation linked to videos were meant for reflection and discussion, but quizzes might have been more effective (Hew & Lo, 2018), and have been introduced together with other materials for students before lectures.

The interventions had no effect on the exam grades as also earlier demonstrated (Shiau et al., 2018)

The aim of this study was to measure the effect of gradually intensified teaching with simulated consultation videos. The study demonstrates that patient-centered elements are learnt at the course. The introduction of simulated video consultations enhanced the students' knowledge and understanding of the more complex clinical topics in general practice but did not have any effect on learning patient-centered elements, where the feedback on their own consultations could have played the major role.

The project took longer than planned, as the data were comprehensive, and it took time to handle and analyze them. Earlier studies about effectiveness of online teaching were sparse then and no study had described teaching assessment this way. The project was performed while the first author was working as a course instructor at the course.

Strengths and limitations

It is a strength that all students were included in the study and that the rate of students participating in both the pre-course and the post-course test were high. A big amount of data was obtained we managed to keep data anonymous.

This study was controlled instead of randomized. Students share teaching materials, which would have confounded an individually randomized design. Therefore, randomized studies are seldom used in educational research (Norman & Eva, 2013). The DanSCORE questionnaire is very comprehensive. A more limited questionnaire designed especially for undergraduate medical students would be more appropriate. The students in this study had no problems using the online material, whereas the teachers had some technical difficulties.

It is a limitation that this study was performed at the early stages of using online video material. Not much research on this subject was found when the project started.

The amount of online material used in this study turned out to be overwhelming for both students and teachers. It has been reduced and adapted to teaching communication, clinical and shared decision

making in general practice. In courses where the students' clinical workdays are sparse, additional videos of clinical topics could be an option.

Conclusion

Introducing simulated consultation videos in teaching general practice improved students' ability to evaluate clinical skills when the videos were discussed in the teaching session. It did not improve students' ability to identify patient-centered items in a consultation.

The DanSCORE questionnaire included many items and took time to complete in a pressured study program. It should be further elaborated and simplified for use in teaching evaluation.

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Supplementary Material 1. The DanSCORE Scheme

Danish Structured Consultation Observation, Recording and Evaluation

The patient's part

1. Do doctor and patient reach an agreement on the topics of the consultation?	☐ ☐ ☐	yes partly no
2. Is the patient`s ideas about symptoms, illness, and self -treatment explored?	☐ ☐ ☐ ☐ ☐	not relevant too much sufficiently too little not mentioned/missing
3. Are the effects of the symptoms on what the patient can do at work and at home explored?	☐ ☐ ☐ ☐ ☐	not relevant too much sufficiently too little not mentioned/missing
4. Is there an exploration into how the limits of function affect the patient`s self-image, norms, and values	☐ ☐ ☐ ☐ ☐ ☐	not relevant too much sufficient too little not mentioned/missing the patient does not want to talk about it
5. Are the patient´s feelings explored?	☐ ☐ ☐ ☐ ☐	not relevant too much sufficient too little not mentioned/missing
6. Are the patient`s expectations of the consultation explored?	☐ ☐ ☐ ☐ ☐	not relevant too much sufficient too little not mentioned/missing
7. Does the doctor summarize the patient's history before the physical examination?	☐ ☐ ☐	yes partly no

The doctor part's

8. Is it correct that this is a task for the doctor?	☐ ☐ ☐ ☐ ☐	yes maybe/cannot be determined no, but the doctor deals with it appropriately no, and the doctor deals with it inappropriately
9. The diagnostic interview is:	☐ ☐ ☐ ☐	unnecessary too comprehensive sufficiently too limited
10. Does the doctor summarize the diagnostic interview before the physical examination	☐ ☐ ☐ ☐	yes sufficiently insufficiently no
11. The doctor's diagnose and conclusion is:	☐ ☐ ☐	correct may be correct incorrect
12. The doctor´s explanation is:	☐ ☐	correct partly correct

	☐	incorrect
13. Is the doctor`s decision professionally/ medically correct based on diagnosis/conclusion?	☐ ☐ ☐	yes cannot be determined no
14. Does the doctor ensure that the patient makes an informed decision?	☐ ☐ ☐	yes maybe no

The mutual/common part

15. How much does the doctor do to make the patient understand the doctor`s *conclusion/diagnosis*?	☐ ☐ ☐ ☐	much a sufficient amount too little nothing
16. How much does the doctor do to make the patient understand the *indication* for further tests or examinations	☐ ☐ ☐ ☐ ☐	out of place too much a sufficient amount too little nothing
17. How much does the doctor do to make the patient understand the plan for further examination and treatment?	☐ ☐ ☐ ☐	too much a sufficient amount too little nothing
18. Is the patient asked to summarize the *diagnosis, indications, and plan*	☐ ☐ ☐ ☐	unnecessary yes partly no
19. The *instructions to* the patient about what to observe and how to react (Safety-net) are	☐ ☐ ☐ ☐	too comprehensive adequate insufficient incorrect
20. Is the patient asked to summarize the *instructions?*	☐ ☐ ☐ ☐	unnecessary yes partly no

The general part

21. Is the time used for the consultation appropriate?	☐ ☐ ☐	no, the consultation is too long yes no, the consultation is too short
22. Is the sequence of the steps appropriate?	☐ ☐ ☐	yes partly no
23. Is each step completed prior to the next step?	☐ ☐ ☐	yes/all steps sufficiently insufficiently, returns to earlier steps too often
24. Does the doctor postpone the conclusion until after the examination?	☐ ☐	yes no
25. Does the doctor use ”signposting”?	☐ ☐ ☐	sufficiently insufficiently not at all
26. Does the doctor adapt the consultation style to the situation?	☐ ☐ ☐	yes partly no
27. Does the doctor use a vocabulary that the patient understands?	☐ ☐ ☐	yes partly no
28. Does the doctor interrupt the patient?	☐ ☐ ☐	no yes, but in an acceptable way yes, too much/ in an unacceptable way
29. How was the doctor`s general reaction to the patient’s mood and emotions	☐ ☐ ☐	appropriate inappropriate cannot be judged
30. How does the doctor use body language?	☐ ☐	appropriate inappropriate
31. Do the doctor and the patient stay within their roles?	☐ ☐ ☐	yes no, but the deviation is acceptable no, the deviation is unacceptable
32. Disturbances?	☐ ☐ ☐ ☐ ☐	none telephone rang the nurse came in the doctor went out to fetch somethingelse: noise, light or other disturbances
33. Where are they in relation to each other?	☐ ☐ ☐ ☐	they are sitting opposite each other at the desk around the corner of the table at the same side of the table

Supplementary Material 2. The Logic and Chronology of a Consultation

The events in a consultation may be classified in ten steps. Each step has a place in the logical reasoning in the consultation process, started by the greetings and finished by the good-bye at the end. The sequence of the steps is logical: Each step assumes only information from the previous steps. Ideally the actual communication and clinical examination is done in this logical order. The graph is used in the development of these skills by the physician reflecting on the course of the consultation, or by supervision and feed-back from colleagues: How and in what order were the topics taken up, and was each step finished properly, e.g., by the doctor or patient summarizing and agreeing on the summary.

The graph is made by stopping the video after 30 seconds and marking the box/boxes in the first column where the topics belong. View the next 30 seconds and mark the boxes. Repeat until the end of the consultation. The diagnostic interview and the conversation during the physical examination are both classified as diagnostic process.

By registering in the grid every time, a topic is dealt with, and for how long, it becomes obvious that the communication does not always follow the logical order. Instead, it may show a return to topics that should have been finished earlier in the process. It may of course be a consequence of the way the patient tells things. However, it also reflects the physician's skills in conducting the consultation.

You now have a graphic representation of the consultation. This is an excellent way to structure analysis and feedback with a colleague. The system may be enhanced in consultations with more than one clinical problem. Instead of simply ticking a box, you register one topic by A and the other by B.

In some situations. you may benefit from stopping the video every 15 seconds instead of 30 seconds.

The Chronology Scheme

Reason for encounter																															
Agreement on topics																															
Patient narrative																															
Shared understanding																															
Clinical filter																															
The doctor's decision																															
Diagnostic process																															
The doctor's decision																															
Conclusion/diagnoses																															
Shared understanding																															
Options																															
Shared understanding																															
Plan																															
Shared understanding																															
Informed decisions																															
Decisions by doctor and patient																															
Safety net																															
Agreement on follow up																															
Chatting and goodbye																															
End																															
Minutes	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		>20

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