MEDICAL PRACTICE

Medical Education

Comparison between videotape and personal teaching as methods of communicating clinical skills to medical students

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Abstract

The efficacy of video recording in transmitting clinical knowledge and skills to medical students was tested by recording on videotape demonstrations of physical examinations given by five clinicians to a randomly selected group of 12 students (personal group) from the first clinical year and then showing these recordings, under identical conditions, to 13 students from the same year (video group). The efficacy of both the personal and video mediums in terms of whether content was retained was tested by a questionnaire completed by all students at the end of the sessions and by a structured clinical assessment in which students were asked to demonstrate some of the same clinical tasks three weeks after the demonstration. In answering the questionnaire the video group obtained a mean (SD) score of 20·8 (7·0) (maximum possible score 40), which was not significantly different from the score achieved by the personal group (17·4 (7·7)). The video group was able to reproduce 44 (10)% of the total clinical steps demonstrated and the personal group 45 (14)%.

Videotaped demonstrations can be as effective as personal teaching of clinical methods, and video should be developed as a medium for first line clinical teaching.

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Introduction

Acquisition of clinical skills is a basic requirement of all medical students. Techniques of physical examination learnt during the first clinical year may have a great influence on a student's subsequent clinical development. Despite this the important task of teaching the methods of physical examination is often left to junior doctors who are themselves in the process of improving their clinical skills to succeed in postgraduate examinations. The poor performance of most doctors at the examination for membership of the Royal College of Physicians, as indicated by a usual failure rate of about 80%, is generally attributed to their poor techniques of physical examination. Clinicians who ask students to accompany them on their ward rounds, or into their outpatient clinics, are known to spend little time on teaching clinical skills.[1 2]

The lack of a systematic approach to clinical teaching has recently been compounded by an increased intake of students into medical schools. Our inquiries suggest that about half the students who emerge with a degree from many schools have not been taught how to examine the nervous system, the cardiovascular system, or joints by a specialist in the discipline. While medical graduates and undergraduates, because of their deficiencies in clinical methodology, miss important physical signs in various examinations their seniors argue about the presence or absence of fundamental signs such as clubbing of the fingers,

extensor plantar responses, papilloedema, or a plateau pulse, to mention but a few examples. These problems could be overcome if uniform and comprehensive teaching on clinical methods could be provided for all students in the first and second clinical years.

The use of films for clinical teaching might encourage students to learn by themselves,[3] but film production is expensive and requires laboratory facilities. Recently video recording has been increasingly used in medical education: video cassettes supplement clinical teaching[4-6] and have been found to be as effective as traditional lectures.[7] To be useful, however, in providing comprehensive teaching on clinical methods, video cassettes must be shown to be as effective as clinical teachers in person in communicating clinical skills. We compared the efficacy of video and personal teaching in communicating clinical skills to students in the first clinical year with little previous clinical experience.

Subjects and methods

SUBJECTS

Students—Twenty five medical students were randomly selected from 150 in the first clinical year who had not previously received any clinical tuition or ward experience. In this medical school, students during the first six months of their first clinical year have four sessions each week for clinical instruction, two for medicine, and two for surgery. As most clinical tutors spend the first four weeks (eight sessions in medicine) in getting students acquainted with the hospital environment and in giving them formal instruction in patient-doctor interaction and history taking, we studied students at this stage in their training. In addition, the clinical tutors of these students were asked not to give them any instruction on practical steps in the particular aspects of clinical examination that were the subject of this investigation.

Patients—Four students and one patient volunteered to act as patients for the initial demonstrations and for the final examination.

Demonstrators—Five clinical tutors, members of the senior academic and clinical staff, agreed to demonstrate clinical examination of systems in their own specialty on normal volunteers.

Examiners—Five clinicians of lecturer or senior lecturer grade with a wide clinical experience were chosen to test the clinical competence of the students.

Each group participating was blind to the part that the other group played in the study.

PROTOCOL

The purpose and protocol of the study were explained to the students one week before the demonstration. By using a table of random numbers 12 of the 25 students were assigned to see the demonstration by the clinical tutors (personal group) and the remaining 13 students (video group) to see the video recording of this demonstration. Students in both groups were of comparable academic standard as judged by the results of their A level and second MB examinations. In separate briefing sessions one of us (MAM) discussed the purpose and the structure of the clinical demonstrations with the individual tutors. Each tutor showed the clinical examination of a system assigned to him in a structured sequence on a volunteer, with a running commentary and with an explanation for each step, to the 12 students in the personal group and to two cameras in the video studio. The clinical examinations demonstrated were, in order, of the thyroid gland and state (eight minutes), the knee joint and joints of the neck (seven minutes), the abdomen and accessible lymph nodes (10 minutes), the cranial nerves and motor system (25 minutes), and the pulse and precordium (six minutes). Students were not allowed to ask any questions.

The demonstrations were recorded in colour with one camera providing a general view of the volunteer and tutor and the second the close up views. The cameras were handled by skilled operators and the selection of general or close up views was made by a producer who had wide experience of the use of video in medical education. The producer was able to direct the camera operators in the selection of appropriate views through an earphone link. Before demonstrating simultaneously to the personal group and the video cameras, each demonstrator ran through his demonstration to ensure against false starts and repetitions. The time required for one demonstrator to replace another permitted a break of about 15 minutes between the demonstrations.

On the next day the video group watched the five demonstrations in the same order in the video studio on a 26 inch (66 cm) monitor. All conditions and intervals were the same as during the previous morning, and students were not allowed to stop and replay any part of the tape. Both groups were presented with a questionnaire on the content of the demonstrations at the end of the session and given eight minutes to complete it. All students were requested not to read about or practise the demonstrations they had been shown.

ASSESSMENT

Questionnaire—Content retention, as an index of communication of knowledge and of the degree of concentration applied by the students, was tested by means of a questionnaire that each student completed at the end of either form of demonstration.

Structured clinical skills test—Acquisition of clinical skills was tested three weeks after the demonstration by means of a structured clinical examination in which each student was asked to perform five clinical tasks (examination of knee joint, abdomen, motor functions, thyroid state, and pulse) in succession in five separate rooms. The same volunteers were used on whom the initial examination had been demonstrated. All the five examiners were unaware of the identity of the tutors who had demonstrated the clinical examination and also of which students belonged to which group. Each clinical task was broken down in sequential clinical steps as had been done by the demonstrator. Each examiner was provided with one sheet for each student and asked to mark a tick against each step successfully completed by the student. The students were asked to reproduce a major part, but not the whole, of the initial demonstration; the examination comprised 139 of the 217 clinical steps shown in the initial demonstrations. Table I shows the check list for clinical skills in the examination of the abdomen. Each tick counted as one mark, and each examiner also gave marks out of five to each student for overall approach, style, performance, and fluidity. Students were given five minutes to complete each clinical task, and, on hearing the bell, they moved to the next room. None of the authors or demonstrators took part in this part of the study, which was conducted by the administrative staff of the school, who collected the check list sheets, counted the marks, and prepared the final score sheets.

Analyses of data and statistical methods—Standard statistical methods

TABLE I—*Check list showing clinical steps in examination of the abdomen*

Clinical tasks	Maximum possible marks
Approach	
Stand on patient's right side	1
While laying him flat observe face for jaundice etc and hands for clubbing	1
Ensure complete exposure from the nipple line to mid-thighs	1
Observe chest, abdomen, and hernial orifices	1
Examination	
Palpation:	
General over the abdomen	1
While palpating look at the patient for any pain	1
Specific palpation—	
(i) Spleen	
Method, flat of the hand: no digging, poking	1
Start almost two inches (5 cm) below the left costal edge	1
Ask patient to breathe	1
Progress towards the costal edge with each breath	1
(ii) Liver	
Start in right iliac fossa	1
Ask patient to breathe	1
Progress upwards with each breath	1
Look at the face for tenderness	1
(iii) Kidneys	
Bimanually with left hand in the loin and right in front	2
(iv) Colons	
Both flanks with finger pulps	2
(v) Aorta, in the midline gently	1
(vi) Hernial orifices (ask patient to cough)	1
(vii) Genitalia, each in turn	2
Percussion towards costal edge and flanks	1
Auscultation for bowel sounds and over major vessels	1
Presentation	
Correct conclusion	1
Smooth presentation	1
Spontaneity and fluency	1
Examiner's impression	5

were used. An unpaired t test was used to determine significance, but, because of a large variability in scores to some of the questions and clinical tasks, the non-parametric Mann-Whitney test on medians was also applied.

Results

Questionnaire—Table II summarises the questions and gives the means and standard deviations of scores for each of the eight questions for the two groups. The mean score obtained by the video group was higher than that obtained by the personal group, but the difference was not significant. A closer scrutiny of the questions and scores showed two interesting points. Firstly, the video group scored better than the personal group in questions 2, 4, and 6 (table II), in which mainly retention of knowledge was being tested. In particular, information about the conditions associated with the collapsing pulse was poorly retained by the personal group, with seven of the 12 students each obtaining 0 out of a maximum score of five. In the video group only two of the 13 students scored less than 2·5 in this question, and the mean (SD) score of 2·7 (1·1) was significantly ($p<0·02$) greater than that of 1·0 (1·3) obtained by the personal group. Secondly, both groups scored poorly in questions 1 and 8, for which some fundamental clinical concepts were required to be understood and retained. In each group six students scored 0 in both questions.

Clinical assessment—One of the students in the personal group was unable to take the clinical test, which left only 11 students in this group. Table III shows the mean score obtained by each group in all sections of the clinical examination. The overall mean score achieved by both groups was remarkably similar, though there was a slightly lesser scatter in the video than in the personal group (coefficient of variation 23% *v* 31%). Students in both groups performed well in the examination of the pulse, but the personal group showed a significantly greater scatter than the video group (F ratio 3·24; $p<0·05$). Students in the personal group scored better in the examination of the knee joint, but the difference was not significant (table III). As might be expected, students in both groups performed poorly in the examination of motor functions; there were more clinical steps than in the four other clinical tasks, and, as is well known, even senior students experience difficulties in mastering the techniques of a neurological examination.

TABLE II—*Mean (SD) scores achieved for each question on questionnaire by personal and video groups. (Maximum possible score for each question was five)*

Question No	Subject	Score: Personal group (n = 12)	Score: Video group (n = 13)
1	Meaning of pulse	2·1 (2·6)	1·8 (2·4)
2	Causes of collapsing pulse	1·0 (1·3)*	2·7 (1·1)*
3	Eye features of Graves' disease	4·2 (1·0)	3·7 (1·6)
4	Diagnosis of effusion in a knee joint	2·0 (1·4)	2·6 (1·1)
5	Meaning of a thyroid bruit	2·5 (2·6)	2·3 (2·3)
6	Integrity of second cranial nerve	2·3 (1·3)	3·3 (1·5)
7	Functions of seventh cranial nerve	2·3 (1·2)	2·4 (1·6)
8	Characteristics of an enlarged spleen	1·0 (1·2)	1·8 (1·7)
Total score		17·4 (7·7)	20·6 (7·0)

*Significance of difference, $p<0·02$.

TABLE III—*Mean (SD) scores achieved by students in personal and video groups in clinical assessments*

System examined	No of clinical steps in original demonstration	Score (%): Personal group (n = 11)	Score (%): Video group (n = 13)
Knee joint	19	57 (17)	47 (17)
Abdomen	27	49 (23)	50 (14)
Motor functions	47	24 (17)	29 (14)
Thyroid state	26	40 (21)	37 (17)
Pulse	20	55 (18)	58 (10)
Total	139	45 (14)*	44 (10)*

*Grand mean.

Discussion

The numbers of students in the two groups were limited by the essential requirement that each student should have an adequate view of the tutor or video. Although the groups were rather small, the results of this study suggest that a video recording of a tutor may be as effective as the tutor's personal demonstration in communicating clinical knowledge and skills to students who have had no previous clinical tuition or experience. Of particular interest was the finding that students at the beginning of their first clinical year, with no clinical knoweldge but a great desire to acquire clinical methods, can reproduce as much as 45% of the clinical skills taught irrespective of the teaching medium used. All the examiners were unanimous in their opinions that at least three students (two from the personal and one from the video group) had acquired sufficient competence and polish to get them through the postgraduate membership examination. These results should be considered in the context of the final degree examination, in which candidates, after three years of clinical education, are required to obtain marks of only 50% to pass. A systematic and structured approach to the preparation of clinical demonstrations by the tutors and the beginners' enthusiasm of the students were probably the chief reasons for the excellent performance of the students in the clinical competence test.

Videotaped demonstration of physical examination has been found to be more effective than a lecture illustrated with slides in providing clinical tuition.[8] Paegle *et al* showed that a lecture recorded on videotape is as effective as a traditional lecture in communicating medical information to students.[7] Numerous other workers have found video cassettes an invaluable aid in medical education,[5-9] particularly in improving students' interviewing skills.[5 10 11] None of these studies, however, has directly compared the efficacy of video teaching with personal teaching in transmitting clinical skills to students. The chief purpose of this study was to explore this important question and investigate whether transmission of information on practical steps is equally influenced by video recorded and live demonstrations. Every effort was made to keep all other variables constant; the same time schedule was used for personal and video demonstrations, the same volunteers were used for the demonstration and examination, and the clinical assessment was based on a step by step structured check list derived from the original demonstration; the examiner bias was thereby removed. The demonstrators, examiners, assessors, and statistician had no communication with each other about this study. The novelty effect of video on the students was minimised by undertaking the study at the beginning of the first clinical year when clinical teaching itself was new to the students.

The overall scores of 17·4 (44%) obtained by the personal group and 20·6 (52%) by the video group on recall of factual information, as assessed by a questionnaire (table III), were higher than we had expected considering that the facts were coupled with practical steps and communicated during a single long session. Students, being mindful of the forthcoming clinical competence test, probably concentrated mainly on the practical steps of the demonstration. Despite the lack of any clinical knowledge or previous experience, these scores of between 40% and 50%, obtained by both groups in the clinical tests and tests on content retention, underline the importance of a structured approach to clinical teaching. As the numbers were small in both groups, and there was a large scatter around the means, no definite conclusions can be drawn from detailed analyses of individual questions. Students from both groups, however, seemed to fare poorly in questions 1 and 8 (table III), in which they had to understand some basic concepts while following the details of the clinical demonstration. These results suggest that clinical sessions designed to teach clinical skills should be kept separate from those sessions in which students are taught how to approach and evaluate clinical problems.

For reasons of comparability we did not exploit the full power of video in this study. Video has several advantages over bedside

teaching—namely, complicated concepts can be explained by showing appropriate tables and graphs in video and abnormal signs can be better appreciated by seeing live or still pictures of florid clinical examples, whereas at the bedside a teacher is limited to showing only one or two patients and has to rely on the students' imagination, or hope for a future demonstration, to get his students to understand a clinical syndrome and its evolution. The approach of most teachers at the bedside is seldom systematic whereas video teaching, because it requires some preparation, is likely to be purposeful, structured, and concise. What video may lose from the lack of interaction between student and teacher and student and patient it gains by providing a comprehensive approach and facilities for reinforcement. Furthermore, video teaching is the only medium that could provide uniform and structured teaching for all students. Video cassettes are transportable, and students can take them home and be better prepared for the ultimate and the most important task of bedside learning. The experiences of a budding clinician are no different from those of a learner motorist, who has to grasp fully the techniques of instrument handling and of driving a car before he can concentrate on his interactions with the roads, road signs, and other road users. Students have to integrate the skills of history taking and the techniques of eliciting physical signs into their normal habits, and only then can they devote their entire attention to understanding patients and their problems.

As a result of this study and in the light of our experience we believe that video could be used as the first line of clinical teaching to medical students in the first clinical year. Primed with clinical skills, they can develop and perfect their own clinical methods and learn from and contribute more to bedside teaching, which itself can then be devoted mostly to clinical problems and their solutions.

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MATERIA NON MEDICA

Not enough books—too many bibles

A recent Materia non Medica article celebrated first and second class travel on the Nairobi-Mombasa railway. It certainly is an excellent train, but perhaps a more memorable experience awaits the traveller who passes by the 10 or 12 upper class carriages and travels in one of the two third class carriages. At least half of the passengers travel in this part of the train. You are not allowed to pay £4 for a four course meal in the upper class dining car; instead you have two options: fill yourself up with maize and beans for fifty pence in the snack bar, or buy samosas. These are pieces of curried meat or vegetable wrapped in pastry. The railway through the outskirts of Nairobi is lined with people waiting to sell them through the windows of the slow moving train. I recommend the samosas—but make sure you have the correct change.

One benefit of third class travel is the people you meet. My neighbours were two brothers returning home for their father's funeral. One of them told me stories of how as a child he had guarded his father's cows from wild animals. The secret of killing a lion, he told me, is to delay your spear thrust until the lion is upon you. He was a member of the same tribe as the president, the Kalenjin. His ancestors had certainly fought lions to protect their cattle but I had some doubt about the claims of this grey suited man.

Paradoxically, I found reading a book a great conversation starter. Both men cast envious eyes on my book—Paul Theroux's *Great Railway Bazaar*, the story of a train journey from London to Japan via India, returning through Russia. They bemoaned to me the difficulty of getting books to read—both were perusing bibles, which they said were the only books available. This is not because of any censorship or restrictions but simply because the literacy rate in Kenya is growing so fast that there are not enough other books to go round. One brother asked me to send him the *Oxford Dictionary of Idiomatic English*.

It saddened me to remember that the prize for best pupil nurse at our hospital never varied—it was always a bible. Mission schools require every pupil to have a bible. Every hotel room contains a bible. Kenya is not a heathen country. I wonder how long it will be before the churches feel they can stop this book propaganda? Must the bible be given to everyone like Chairman Mao's little red book? Is there no alternative prize for good pupils?—JIM THORNTON, Chogoria Hospital, Kenya.

Clinical curio: lifelong phantom limb

A man and a woman, both aged 90, endured painful phantom legs for 75 years after undergoing above knee amputations in 1909. The woman had undergone amputation for osteomyelitis and had thereafter led an active life as had the man, who had undergone amputation after sustaining an injury while playing football. In his 90th year he presented with increased pain and received transcutaneous nerve stimulation. Two weeks later abdominal pain led to the diagnosis of a large aortic aneurysm, which was presumably responsible for the increase in pain. He died a few weeks later.

Surgeons assure amputees that pain from phantom limbs will improve but know that the expectation of life is usually short. Three quarters of major leg amputations in civilian practice today are for arterial insufficiency[1]; the arterial disease is often generalised and the prognosis poor.[2] Transcutaneous nerve stimulation may be an important advance,[3] but it is only palliative, and phantom limb can be a lifelong complaint.—NICHOLAS PARKHOUSE, senior house officer in general surgery, Kingston-upon-Thames, RICHARD CORBETT, senior surgical registrar, London.

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