5 Postgraduate Continuing Medical Education via Videoconferencing at the K.U.Leuven in Belgium: An Evaluation of Pentalfa

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Abstract

Traditionally medical specialists attended seminars organized by clinical university departments of the K.U.Leuven Medical Faculty. However due to increasing travel and traffic problems the Pentalfa project was initiated in an effort to replace face-to-face seminars.

We applied ISDN-videoconferencing technology to interconnect the video and sound signals of the different sites in real time. In all sites the session could be followed on two screens. On one screen, either the speaker/moderator or person involved in dialogue at a remote site could be seen or whatever else was being sent via videoconference. On the second one, which was linked to a multimedia computer, digitized images are projected. A voting system was used to interconnect all sites and allowed the participation in the various voting opportunities, which occurred during each session. For each session, a topic within a specific discipline was chosen and treated in a multidisciplinary way.

The Pentalfa project was initially planned for a period of 3 years. During each academic year, 2 to 3 periods of 89 sessions each were organized (total of 74 session). A questionnaire, completed with open questions, was given to all participants (over three years 13 489 participants). 28.2 % of the questionnaires were returned.

We reached 64.6 % male and 35.4% female participants with the program. The percentage female participants was higher at the central than at the guest sites. The mean age of the participants was 37.7 years. Male participants were older than female. At the central location the mean age was lower than at the guest locations. The percentage female participants decreased in the older age groups.

Timesaving was an important goal for starting up the project. Nearly 90% of the public at the guest sites said they saved time by attending the session. The averaged time saving per participant in these guest locations increased from 99 min in the first year to 145 min in the third year. This emphasizes the growing mobility problems of our society.

Globally, participants were satisfied with the pedagogical approach used in Pentalfa. More than 55 % of the participants found the Pentalfa session easier than classical seminars. Participants at the guest sites and older participants had a more positive appreciation than

the average. In the evaluation we found that satisfaction about the technology was very high. The very excellent appreciation of the quality of the image, even in the absence of a lecturer, indicates that the concept of using 3 ISDN (6 lines) connections is sufficient for long-distance education

The global cost per participant at the guest locations was 44.5 euro/h broadcasting and their virtual saving was 64 euro/h. More than 85 % of the participants at the guest sites stated that they would no longer go to Leuven (the central location) for these sessions if they were to be organized in a traditional face-to-face manner, mostly due to time and/or traffic.

In order to come to a sufficient result for long-distance education via videoconferences from the participants, a lot of efforts are required. Once all those problems are resolved, this medium seems to be very suitable as an alternative for the increasing mobility- and accompanying time problems

The experience obtained with Pentalfa, will be used for other aspects of the medical service such as “second opinion” or “Telemedicine”.

Keywords: Videoconferencing, Medical Continuing Education, ISDN

1. Introduction

Due to the rapid evolution in the medical sciences, lifelong learning is required for everybody involved in the medical field. The overall intention of the Pentalfa project was to provide continuing professional opportunities for medical specialists in the Flanders region using telepresence. Many of the specialists are in fact graduates from K.U.Leuven’s Medical Faculty. It was with the intention of supporting these alumni that the project was started. Traditionally these specialists attended educational seminars organized by their various medical clinical departments. However the increased workload and the dramatic rise of problems with traffic and mobility heavily mortgaged the permanent education. As a consequence more and more doctors gave up and the permanent education suffered. However this type of interactive education had to be preserved and therefore other forms of transfer of knowledge had to be investigated. An integration of the telecommunication technology in the

permanent education could help to resolve the problems in mobility. We took the option to offer a part of the medical permanent education in the form of long-distance education and named the project "Pentalfa".

In weekly sessions during the academic year, a multipoint videoconference was organized dealing with a different medical topic, and with a different set of experts and audience. All the large hospitals in Flanders were contacted and visited in order to identify the most suitable sites for participation. In addition to the level of interest and willingness to participate, further criteria in this choice were suitability as a venue from the point of view of technical infrastructure and location, in order to enable us to provide a service to a widely dispersed geographic audience within Flanders. It was agreed that these educational evenings were to be offered without charge to participating doctors and therefore a sponsorship plan was put in place.

The goal of the Pentalfa project for long-distance education was to offer the same educational program to physicians at different locations in Flanders in an interactive way and using advanced equipment for videoconferencing.

In order to achieve our goal, a unique system had to be developed allowing optimal bilateral data transmission and processing of video- and high-resolution images. Also the system should be able to present, in a reliable, simultaneous and interactive way, the videoconferencing at different locations. In the evaluation of the efficiency of the project we first evaluated the audience reached by the program. We therefore identified the age, gender and specialization of the participants at the different sites and how they came into contact with the Pentalfa program. We were interested to know whether the evaluation confirmed the multidisciplinary nature of the sessions and also whether time saving was generated.

For the evaluation of the educational efficiency of this project we focused to somewhat more subjective aspects and analyzed whether a number of parameters about the scientific information content and pedagogic effectiveness of seminars were influenced by the use of a videoconference platform. Finally a financial cost/benefit of the project was made.

We conclude that the project continues to enhance the quality of medical treatment within Flanders.

2. Methods

2.1. Determination of the number of participants

The number of participants per session was determined by counting the audience by the technician at each site. This counting took place in a standardized way. At the start of the second presentation all technicians counted the number of participants. This counting was initiated via the chat box by the central technician.

The number of physicians requesting accreditation was determined via the accreditation lists filled out at all sites during each session. The forms of the questionnaire were distributed together with the handsets at the beginning of the session and collected afterwards. Participants could also return it by mail.

2.2. Methodology of Evaluation

A multiple-choice questionnaire, completed with open questions, was given to all participants. They were asked to fill out the questionnaire (anonymously if they wanted) and return it after the session or by mail. This questionnaire was used during these three years.

2.3. Calculation of the costs of the Pentalfa project

The calculations are based on 74 videoconferences over three years, each with duration of 2.5 hours. This gives 185 hours of real videoconference time in 3 years.

To determine the costs the following aspects were taken into account. The equipment at all sites, including the central site (Leuven) was purchased for 508 205 Euro with deprecation over three years. Per session we needed on the average 6 hours of continuous communication by phone (preliminary tests included). The communication costs of 444 hours over 21 ISDN lines was 94 763 Euro/3 years. The salaries of administrative and technical aid (including overhead) were 171 045 Euro/3 years. The working costs including technician's costs (paid on an hourly rate) and travel were 89 241 Euro/3 years. The costs of the brochure (first two years one, third year three brochures) and mailing and other direct costs were 91 494 Euro/3 years. The global costs were therefore 974 748 Euro/3 years. Catering costs were not taken into account since catering was also offered on classical seminars.

Following procedure was used to estimate the money saved per participant at the guest sites. First of all, the mean time saved per site was calculated based on the answers obtained from the questionnaire. We asked all participants to write down very precisely what was in their opinion their personal time saving. We calculated the average money saved for this time saved on the basis of a modest loss of an income of three consultations/hour for a specialist in Belgium (49.65 Euro/hour).

The travel expenses were calculated for all participants at the guest sites based on the official cost for a two-way travel by car from the guest sites to Leuven (0.29 Euro/km). The precise distance was determined by a route planner (http://www.alh.nl.alh/).

2.4. Statistical analysis

The statistical analysis of all data was done via SPSS. Significance was determined at $P < 0.05$. As age categories

following groups were made: younger than 30 years; between 30 – 39 years; 40 – 49 years; 50 – 59 years and older than 59 years.

3. Results

3.1. Videoconference Equipment & Intranet

In long-distance education the possibilities to interact have to be identical to the tools used in classical seminars. Furthermore the quality of image and sound has to be high. It is also required that different didactic tools can be integrated. In order to fulfill all these goals we chose to use two projection screens at all sites. On one screen the image of the videoconference and the videotapes could be shown. On the other screen high resolution-images used during the presentation could be projected via the use of an intranet. All other media used were integrated in this second circuit.

We applied ISDN-videoconferencing technology to interconnect the video and sound signals of the different sites in real time. Image and sound were hereby compressed and transmitted via digital phone lines to the other locations. For the videoconference the H-320-videoconference standard was used. Due to practical and financial concerns we excluded the use of satellite connections. We found that three "Basic Rate ISDN" BRI connections were required in order to generate a sufficient image quality and to be able to organize a meeting in optimal circumstances.

A 16-port videoconference bridge was used to link all sites in a multipoint videoconference. This bridge was attached to two Primary Rate ISDN (PRI) connections. The conference could operate in the Continuous Presence-option. This allowed the lecturer to view simultaneously the four other sites. At the different locations this option allowed to show the speaker, the moderator or the participant asking a question or to project on one screen simultaneously the four images of the other locations using the quad split. The central technician controlled the switching option.

At all locations a videoconference Codec with camera and T120 standard was present. The speaker and/or moderator could follow the event via individual monitors. From preliminary tests it was concluded that the transmission of the high-resolution images on the T120 standard proceeded very slowly and was of poor quality. We therefore decided to present the educational audiovisual material via an alternative circuit. A further 128 kbit ISDN connection (2 lines) was used to trigger locally available audio-visual presentations of all speakers. The speakers were encouraged to convert beforehand their normal audio-visual presentations into Power Point files. We hereby ensured a house style and the optimal audio-visual quality of all presentations.

3.2. Voting system

A voting system was used to interconnect all sites and allowed the participation in the various voting opportunities, which occurred during each session. The active communication of 300 participants was possible by typing an answer via the numeric keypad or by using the audio facility of the handset. Since radio based systems could interfere with a hospital environment, infrared technology was applied. The infrared signals of the handsets sent audio- and data information to the local PC at each site. This PC was connected via the intranet over the ISDN line with the central PC. When a lecturer wanted to know the participants' opinion about some subject, the voting system could be used. The questions appeared on the screen as part of the presentation. The multi-site software also allowed to calculate and immediately distribute all results.

3.3. Content of the evening

In all sites the session could be followed on two screens. At each peripheral site, a local moderator coordinated the session (especially the discussion) and controlled the process of issuing of the credit points (accreditation). A central moderator, in Leuven, coordinated the entire evening and had the final responsibility. He usually brainstormed beforehand with the different speakers in order to realize the final agenda. The speakers and the moderator eventually were given the opportunity to try out beforehand their presentations, either in the audio-visual center or in the hospital facilities in K.U.Leuven. In the first year the topics were chosen from specialist disciplines. From the second year on, also three sessions were organized specifically intended for general practitioners.

3.4. Videoconferencing Sites

Leuven was the central location for the Pentalfa project. An auditorium of the Teaching and Research building (Onderwijs en Navorsing) of the K.U.Leuven Hospital Gasthuisberg was completely reorganized and adapted to provide facilities for videoconferencing with the latest state-of-the-art technology. At this site the overall technical control of the session was supervised by the central technician.

The first year of the session of Pentalfa project were divided in two periods, where each time 4 hospitals were visited as guest site. At each site 12 sessions took place. The locations were chosen to obtain an optimal spread over Flanders. On demand of the participants, from the second year on, the year was divided into three periods, where each time 4 guest locations were visited. The number of sessions per period was reduced to 8 or 9 per period. During the three years of the project 20 different guest sites were visited (or revisited). For each session a local physician was moderator at his guest site. The speakers could give their presentation at each of the five locations but were usually present at the central site.

While at the central location the two screens made part of a fixed setup, this was not possible at the remote sites in the different hospitals, since the locations changed from period to period. Depending on the infrastructure of the hospital, the session could take place in a multifunctional room or in an auditorium. Usually the technical support was not in a separate room. Before a location could serve as a Pentalfa guest location, a blueprint of the set-up was drawn during a preliminary visit http://www.avd.kuleuven.ac.be/bic/. Also the different ISDN lines were controlled for compatibility. We faced communication problems in nearly 40% of the guest locations during the setting up image connections. Pentalfa provided the videoconferencing equipment. Due to the multiplicity of situations at the different guest sites, we chose for a temporary and very adaptable, quickly installable and mobile setup at the guest locations. For every session the installation of the set-up at each guest locations took about 1 hour time for the technician coming from Leuven. The mean time to check image and sound quality between the different sites was 1.5 to 2 hours. If voting would take place the installation- and checking time was much longer. The different technical collaborators could exchange information via the chat box. Moving the set-up from one site to another took half a day for two technicians.

3.5. Participants

During our three-year program the total attendance of the 74 sessions, that were organized, was 13489 participants: an average of 182 participants per session. Initially we started with two periods of 13 Pentalfa sessions per year but at the request of the participants from the second year on three periods were organized. During the second year a 10% rise in participants was generated. The number of participants per session remained more or less constant during the third year. About 2/3 of the participants attended the session at a guest site. he spread in the absolute number of participants per session was quite large. Of the 74 sessions the lowest number of participants was 49, the highest number 402. Also presence of physicians at a particular guest site could vary between 8% and 22% of the total participation of a session.

These numbers indicate that there is a clear interest in long distance education via videoconferences. Also a rather constant number of participants preferred to go to a guest location.

Credit points have to be obtained by registered physicians in a regionally administered educational system (accreditation system) in order to obtain an optimal reimbursement by the Belgian social security system. Physicians attending the Pentalfa sessions could obtain credit points. More than ¾ of the participants applied for these credit points.

The multiple-choice questionnaire was given to all participants. 28.6 % of the questionnaires were returned over those three years. More than 60% of the reactions came from the guest sites. We obtained questionnaires from all sites and all sessions.

3.6. Profile of the participants

We asked the participants about their age and gender since it is possible that the attractivity and impact of video conferencing differs with age or gender (Pym, 1992).

Overall 64.6% of all the participants on the program were male and 35.4% was female (n = 3814). Over the three years also a slight rise in the percentage of female participants was found. At the central location more women were present (43.6%) than at the guest sites (31.5%). The mean age of all participants was 37.7 ± 0.3 years (n = 3814). The oldest was 79 year, the youngest 17 years. At the central location the mean age was statistically lower (34.8 ± 0.4 years) than at the guest locations (40.2 ± 0.3 years).

The age group also influenced the percentage of participants of each gender. Male participants were older (43.3 ± 0.3 years) than female (31.4 ± 0.3). Female participants made up 60.8% of the age category below 30 years (n = 582) while in the age group between 50 and 59 years old it was 14.5 % (n = 574).

From the second year on we asked the participants to specify their relationship with respect to the topic of the particular Pentalfa session of that evening. The possibilities were "specialist in the topic of that particular evening", "specialist but in another field than the session of the evening", "general practitioner", "resident in training" and "paramedical or non-medical profession" (n = 3580 answers). 37.4% considered themselves specialist in the field of that specific session, 32.3% was specialist but in another field, 9.8% was general practitioner and 10.6% had a paramedical or non-medical discipline. A lower number "specialists in the particular field" was found at the guest sites than at the central site. Also the number of general practitioners and specialists of disciplines, not directly related to the session was higher and the number of trainees was significantly lower at the guest locations. No difference in the participation of paramedical or non-medical professions was found between the sites.

These results are compatible with the finding that the attendants were younger and that the percentage of residents in training was larger at the central location, which is the university hospital. It also shows that not only specialists of the subject of the session were reached. The large number non-experts in the item of the session (specialists and general practitioners) as well as the presence of residents demonstrated the multi-disciplinary character of the videoconferences.

3.7. Participation to videoconferences

The use of videoconferences is not widespread in the medical field in Flanders. On the question at the start of the program in 1998 whether the session was their first participation to a

videoconference, more than 90% of all participants gave a positive answer. The percentage participants having their first Pentalfa session gradually decreased from 70% in the first year to 40% at the end of the third year. Also the percentage of participants attending a second session was reduced during the last year. This was mainly caused by the rise to 60% of the number of participants having already attended 2 or more sessions. A similar evolution was found for both genders. However, male participants had attended a higher number of sessions than women.

3.8. Time Saving Effectiveness

The participants at the guest locations were asked whether a time saving was generated and eventually how much. The results confirmed largely the expectations. Nearly 90% of the public at the guest sites claimed they saved time by attending the session. The mean time saved per participant in these guest locations increased from 99.3 ± 2.4 min (n = 596) in the first year to 121.4 ± 2 min (n = 648) in the second year and 145.1 ± 2 min (n = 704) for the third year. This demonstrates the rapid rise of mobility problems in our society. On the level of the individual return of questionnaires the spread of the answer was much larger: it varied between some minutes to 7 hours for the most distant sites. We found no difference in time saving as a function of age or gender.

At the start of the second period of the first year we asked all participants at the peripheral sites whether they still would come to go to the central location if this post graduate program only would take place in Leuven (central location). 67.5% of all participants answered negatively in the first year. This amounted to 89.8% in the second year and 86% in the third year. The most dominant arguments were (in decreasing order of importance): distance, no time, traffic, no interest in the session and/or the job.

3.9. Evaluation of the technical aspects

We were interested in the evaluation of the technology and we asked all participants to express their opinion about the quality of sound and of image using a score from 1 (poor quality) to 5 (excellent quality). The global score for the quality of the image was 3.72 ± 0.01 and for sound 3.87 ± 0.01 (n = 3743). For voting the score was 3.76 ± 0.02 (n = 3119). For sound, image quality and the voting respectively 73.4 %, 65.2 % and 69.7 % of all participants gave as appreciation “very good or good”.

We detected no gender differences or shift in the appreciation of the quality of the images over the consecutive years. At the remote sites the evaluation was slightly but not significantly higher. For the quality of the sound, the appreciation at the remote sites (3.93 ± 0.02) (n = 2580) was more positive than for the central site (3.70 ± 0.03) (n = 1167). This could be due to the fact that a large effort was made before every session to optimize the sound at the remote sites. It should be noted that the older participants had a slightly more positive appreciation. In the age group < 30 years the score for image, sound and voting was respectively 3.74 0.01; 3.83 ± 0.02 and 3.80 ± 0.02 (n = 566). For those above 59 years values were 3.97 ± 0.03; 4.09 ± 0.02 and 4.05 ± 0.02 (n = 276).

The very excellent appreciation of the quality of the image, even in the absence of a lecturer, indicates that the concept of using 3 ISDN (6 lines) connections is sufficient for long-distance education. The evaluation as a function of the age category also showed that the evaluation is more positive for the older than for the younger participants.

3.10. Scientific Content of the program

Pentalfa offered the physicians the possibility to get an up to date overview of several medical topics. The clinical department of the central moderator, in agreement with all speakers, was the organizer of the session and took the final responsibility of the scientific content of the session. Pentalfa functioned as a logistic, pedagogic and technical intermediate for the organization of the long distance education via videoconferences. For the evaluation of the educational efficiency of this project we focused some of the questions to somewhat more subjective aspects, for instance on how participants felt about the quantity of information received, their ability to memorize it, etc, and analyzed whether a number of parameters about the scientific information content and pedagogic effectiveness of seminars were influenced by the use of a videoconference platform.

We therefore asked the participants to evaluate the way they were able to follow the session compared to classical continuing education programs. 92% of the participants (n = 3567) answered this question. 56.4% of which found it “much easier or easier” than classical continuing education programs. There was no shift in opinion during the program or also no gender difference. However a higher value (59,5%) (n = 2476) was found at the guest sites than at the central site (49.3%) (n = 1091) although the speakers were mostly not present at the guest sites. Also older participants had a more positive opinion while 52.3% participants younger than 30 years (n = 509) answered “easier” or “much easier”. The percentage increased to 64.3% for specialists older than 50 years. Especially this latter group was more favorable towards the statement “much easier”.

We also tried to evaluate whether the videoconference positively influenced other aspects of the learning process. In addition to a question about the pedagogical quality of the lectures apart from their scientific value we asked whether the videoconference had a positive influence on: (1) the amount of information received, (2) the understanding of the information received, (3) the capacity to memorize the information received and (4) the capacity to apply the information received in their personal life. Participants had the possibility to “agree absolutely”, “agree”, “have no opinion”, “disagree” or “absolutely disagree”.

We received a very positive response about the subjective effects on the learning process. Overall 74% "agreed or completely agreed" that the videoconference positively influenced the amount of information received (n = 7627 respondents); for the understanding of the information received it was 72.6%, for the capacity to memorize the information received this was 60.4%, for the possibility to apply the information received in the professional life it was 62.2% and finally for the pedagogical quality of the lectures 72.3%.

From these data it can be concluded that the possibility of memorizing and the practical application of the information received a slightly less positive appreciation than the other aspects. We found no gender differences. However participants of the group older than 49 years had a more positive feeling than the younger (<30 years) participants although the same items scored higher or lower for all age groups. Specialists at guest sites were also more enthusiastic than at the central location.

We found important differences regarding age. Older participants (group of people over 49 years) were more enthusiastic about an improvement of the learning process than younger participants. This contrast with the preconceptions that one might have about this kind of learning for this age group.

3.11. Different aspects of the interaction

Several strategies were developed to obtain an optimal interaction between the different sites. First of all the software of the videoconferencing was equipped with the "continuous presence" option. This software allowed to project the different locations onto one single split screen image and to have a discussion with all sites. As a consequence of this option the number of participating locations was limited to five in order to optimize the visible interaction.

At all the locations a moderator was present to encourage and control the discussion. An excellent moderator is indispensable in interactive discussions via videoconferences, probably even more then in classic face-to-face debates, since direct knowledge of what is going on in a guest location is less evident. Of course the split screen resolved part of the problem, since all locations could see each other. But part of the problem remained and therefore an excellent moderator remains the cornerstone of the debate.

Thirdly cameras and monitors were provided for all moderators and for the public in order to optimize the visual contacts between the different sites. Also everybody obtained the opportunity to ask questions since a microphone was present in the handset of the voting system. This wireless microphone allowed everybody to ask questions that could be heard on all other locations. Previous experience has taught us that individual microphones are indispensable for efficient discussion and question sessions. Finally the voting system encouraged and improved in an efficient and anonymous way the active contribution of the public.

We investigated how the participants evaluated the thus created interactivity of the Pentalfa sessions. The possible answers were "very poor", "poor", "moderate", "good" and "very good". 60.2% of the participants rated the interactivity as good to very good (3586 answers). No difference was found compared to the sites or over the three years of the project. It was however noticed that more female (65.6%) (n = 1261) than male participants (57.3%) (n = 2489) had this point of view. An important negative remark, frequently cited, was that participants could not understand that questions from one location were not discussed, while a moderator tried unsuccessfully to encourage a discussion at another location. This emphasizes again that moderators play an important role in multipoint videoconferences.

3.12. Analysis of the costs and returns of the Pentalfa project

Also the economic implications of the Pentalfa project were investigated. The global costs were 974 748 euro for three years or 5 269 euro per hour broadcasting (74 sessions of 2.5 hours). The individual cost per participant at the guest locations was 44.5 euro per hour broadcasting (n= 8745).

We performed also a simulation of the average (virtual) money saved by the participants on the guest locations. Therefore, the overall money saving due to decreased loss of time (927 849 euro) and cost of transportation (481 831 euro) were determined for those three years, as discussed in the Methods section. The virtual saving per participant on the guest locations was 64 euro per hour.

We therefore estimated a virtual gain of about 19.5 euro per participant per hour broadcasting. These results demonstrate that the cost per hour broadcasting is very high. This is mainly a consequence of the quality that has to be offered. From an economic perspective it is however important that the virtual return exceeds the cost of this for the participants free long distance education project.

4. Discussion

Long-distance education via videoconferences is still a rather recent concept in the landscape of the permanent education. Due to the growing mobility problems the need for this type of long-distance education is expected to explosively increase. The faculty of medicine of the K.U.Leuven therefore decided in 1998, to offer part of its programs via videoconferences. In collaboration with the audiovisual service of the K.U.Leuven a new organization was started. Based on the experience of the audiovisual service and of the projects "Big" and "Savie" the Pentalfa project was set up http://www.avd.kuleuven.ac.be/bic/. The purpose of Pentalfa

was to offer on a regular basis simultaneously long-distance education at different sites and via videoconferencing.

An auditorium was transformed at the campus Gasthuisberg especially for this purpose. This auditorium was completely adapted to the new forms of education. We made contacts with several hospitals in the Flemish region of Belgium. We were convinced that auditoria in hospitals were the perfect place for the medical permanent education and spent time to ensure an optimal spread of the remote sites over Flanders in order to limit the traveling time of the participants to a minimum.

For these videoconferences we used ISDN technology. Digital phone lines have the advantage that they could be installed everywhere, can be used much longer than the scheduled time of the session and also have a reasonable cost. This technology also allows the participants to debate continuously with each other. Finally the digital phone lines also appear to be very reliable since we encountered only very few problems with the data transmission to guest sites. The technology we used for data transmission was however not sufficient for the transmission of high-resolution images. This was something we knew from the beginning. Therefore a second circuit that was controlled via an intranet was installed. Hereby the main computer triggered the individual computers at all sites to present the same sequence of Power Point slides. This way the presentation and messages of the speaker, including the movement of his computer mouse-arrow could be followed at all the locations. (Baak et al., 2000). This intranet also served as an chat box for the technical collaborators and for the control of the voting system. The whole system was flexible so that parts of a session could be presented at different locations.

There was a clear interest for the Pentalfa sessions, as can be deduced from the number of participants. This number increased from 173 participants per evening in the first year to 188 participants in the second year and then saturated to a similar level. From the remarks on the open questions of the questionnaire it was clear that a very large number of participants really needed this type of multidisciplinary long-distance education. An important number of participants (2/3) wanted to attend those sessions at the guest sites near their homes. The established physicians wanted to obtain their study points in the context of maintaining their accreditation. The percentage even increased from 73% in the first year to 83% in the third year. The applications for credit point for the accreditation were especially very high at the guest sites. Our evaluation of the Pentalfa project is based on a very large number of questionnaires answered by the participants over a three-year period.

The data were obtained from all guest sites and of all 74 sessions investigated. Over the three years the number of questionnaires sent back was 28.6%. This number was higher in the first year (35%) while during the last year it was only 23%. Especially at the central location we received frequently the remark during the third year that participants had already filled out the questionnaire before. The nearly 30 % return of the questionnaires may indicate that the participants had a clear interest in the program and in the concept. Analysis of the forms learned that two thirds of the results were coming from the guest locations. This correlated well with the number of participants present at the guest sites.

The participants of the Pentalfa sessions are representative for, or at least compatible with the changing profile of the physician in Flanders. First of all the distribution - two third men and one third women – fits very well with the gender distribution in the medical profession. The mean age of the women, a group that only recently joined the medical profession in large numbers, is therefore lower than for their male colleagues. Also in the age category below 30 years, more women are represented. This fits with the distribution of the medical students at the Flemish universities in general. The data also demonstrate that there is a gender difference between the central and the guest locations. More female participants were present at the central location than at the guest sites. Also the mean age was lower at the central than at the guest sites. This correlates with the fact that at the central location more doctors in training participated in the programs.

The data demonstrate that long-distance education in Flanders is a rather recent phenomenon. It is nevertheless clear that gradually more and more participants attended more videoconferences. Male participants attained the highest number of sessions. Due to the large variation in items, the rotation of the sites and the multi-disciplinary character of the sessions, it is clear that even after three years a large number of attendants participate for the first time in a videoconference. However the rotation between guest sites makes a clear analysis of this point not easy.

Our data clearly demonstrate that physicians attending educational evenings at the K.U.Leuven face more and more problems due to traffic congestion and subsequent time loss. The Pentalfa project was initiated in an effort to replace a number of these face-to-face seminars. Most of the participants agreed that they saved time by attending the session at a guest site. The average time saved also increased with about 46% from 99 minutes in the first year to 145 minutes in the third year. Our data confirm the fact that today the mobility problems explode, and Pentalfa, and video-conferencing in general, can contribute to the partial solution of these problems in Flanders. Pentalfa helps them to keep contact with the university and its hospital.

We also investigated whether we fulfilled our goal of organizing multidisciplinary sessions. In spite of the fact that one clinical service assumed the final responsibility over each session, mostly speakers of different disciplines were participating. Also the profile of the participants gave information. In the questionnaire we asked how the participants related to the subject of the session. From the answers it can be concluded that the number of general

practitioners and specialists of disciplines not directly related to the session were lower at the central site, but that the number of trainees was significantly higher. These results also explain why a younger and more female public was found at the central site.

We were interested to have the feedback of the public on the technical aspects of the videoconferences. For that purpose the participants had the possibility to score the quality of image, sound and voting via a questionnaire. In global over the three years 27,74% of all participants (3743 on 13489) answered on this evaluation. The result of this evaluation was quite positive and promising. The evaluation of the audio- and image quality using 3 ISDN lines was very good. It was even clear that the evaluation at the guest locations was even slightly better than at the central location. This indicates that the efforts done at the guest sites, such as installation of uniform equipment, presence of a technician etc, have attained their goal. The technical aspect proved to be good and did not change during the project. While there were no gender differences in the evaluation of the technical aspects some age differences were observed. The group of 60 or more years old, gave higher scores on the technical aspects of the sessions than younger participants.

Because the technology is transparent, it was possible for the speakers and the participants to select or to direct their attention to the content of the session. Technical problems only very rarely occurred and the participants also found the voting system easy to use. Overall participants were very satisfied with the pedagogical approach of Pentalfa. Videoconferences were seen as a very effective tool to transmit information, to understand it, to memorize it and to apply it in their daily work. It was clear that especially the information transfer was more successful than the possibility to apply everything into daily professional life. Our results suggest that it would be useful to instruct the speakers not to overload their presentation with information in order to make it for the audience easier to remember the data presented.

Younger doctors make less difference between videoconferences and face-to-face classical seminars, probably because they are more familiar with these new information technologies. But more mature professionals, who are more used to classical face-to face lectures, especially appreciated the quality of the seminars (speeches, documents ..), which were often better than ordinary training, and realized how much time they were saving. Maybe this is an explanation for their deep enthusiasm. That the lecturer is not present at a location is not a problem: the evaluation was even more positive at the guest sites. No specific gender related behavior patterns were found for these aspects and results prove that neither gender nor age are factors that can limit the impact of this kind of system on the target audience.

The economic aspects were also very important for the evaluation, and for money and time saved by the participants. It is important to know that nearly 90% of all participants at the guest sites said they were no longer willing to come to the central site if the session was only organized in a classical way at the central site. The costs of the videoconferencing remain high, but are mainly due to the high requirements of the quality imposed by the target group. Videoconferences require a very intensive preparation: organization and preparation of the sessions, as well as preparation of the individual presentations. In line with this, speakers and moderators find they need much more preparation time compared to classical lectures. However their efforts were really appreciated by the participants of these sessions.

In order to come to a sufficient result for long-distance education via videoconferences from the participants, a lot of efforts are required. This is certainly the case for projects where videoconferences are held including more than two sites. If multipoint videoconferences are organized in a regular way, the technical logistic and interactive requirements increase enormously. Problems with multi-site videoconferences include the complexity of the system, timing and the need for booking sites, coordination of speakers and presentations, and the time needed to organize sessions, set up linkages, advertise sessions etc. Successful meetings are also associated with effective linkages and trouble-free hardware. In our evaluation we found that satisfaction about the technology was very high. Once all those problems are resolved, this medium seems to be very suitable as an alternative for the increasing mobility- and accompanying time problems (Hebert, 2000). It is important to note that the experience obtained with Pentalfa, can be extended to other aspects of the medical service, such as “second opinion” or “Telemedicine”.

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