Computerized Scientific Exhibit Utilization: Observations From infoRAD at the Radiologic Society of North America Scientific Assembly

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No publication has discussed utilization of computer scientific exhibits (CSE) at national symposia, despite their growing numbers. The hypothesis of this project was that, when given a choice, viewers initially would prefer a more conventional paper presentation of a scientific exhibit over that of an electronic presentation. A nearly identical paper version of the introductory screen to an infoRAD CSE was placed adjacent to the workstation. Utilization of the paper introduction, computer introduction, and both, as well as subsequent behavior, was recorded. Of 67 visitors, initial user choice was 56.7% paper and 43.3% computer. Over the entire time at the exhibit 25.4% only looked at the handout, 25.4% only at the computer, and 49.3% perused both. Only 10.5% completed the entire exhibit, and 0.94% of total registrants visited the CSE. Overall, 74.7% perused the CSE when leaving the exhibit area. Upon arrival, viewers preferred the more conventional paper presentation, confirming the project hypothesis. Surprisingly, about 75% eventually perused at least a portion of the computer presentation. Although a small fraction of Radiologic Society of North America (RSNA) registrants visited the CSE, the findings presented are promising and suggest that CSE presence at national meetings is justifiable, providing a "first step" toward CME outcomes analysis of CSE. Overall, these findings are promising and suggest that computer scientific exhibit presence at national meetings is justifiable. Copyright © 2001 by W.B. Saunders Company

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THE POSTER SCIENTIFIC exhibit (PSE) has been a long-standing component of medical meetings. Given the visual nature of our specialty, such exhibits regularly constitute a significant portion of radiology national meetings because they display graphs, figures, and particularly, images easily.

Computerized scientific exhibits (CSEs) are a relatively new component of national symposia. Their advantages are many: they take up less physical space, can display many more images than possible on a conventional PSE, are cheaper to assemble, allow easy viewing of only those components the reader is interested in learning, allow modification with subsequent advancements in technology, and can be published elsewhere without modification (eg, the internet or on CD-

ROM) allowing for multiple usage. Disadvantages include longer preparation times, access limitations at a single workstation during the meeting proper, and decreased comfort by the user with a somewhat foreign presentation interface.¹

To date, no publication has discussed the actual utilization of CSE at a national meeting. The hypothesis of this project was that, when given a choice, viewers initially would prefer a more conventional paper presentation of a scientific exhibit over that of an electronic presentation. To test this, a nearly identical paper version of the introductory screen to an infoRAD CSE was placed next to the workstation at the Radiologic Society of North America (RSNA) Scientific Assembly. Utilization of the paper introduction, the computer introduction, or both, as well as subsequent behaviors, were observed and recorded. Results, as well as limitations and caveats, are discussed.

MATERIALS AND METHODS

We presented an InfoRAD CSE at the RSNA Annual Symposium, which was presented as a hypertext markup language (HTML) web page. The introductory screen included the CSE abstract with stated learning goals as well as HTML links to embedded subsequent sections continuing further detailed discussion. Adjacent to the workstation, on the countertop, a paper version of the computer introductory screen was offered as an alternative. Its appearance was nearly identical: it did not include color or the internal links, but all else was included.

The computer CSE was reset to the introductory screen whenever it was vacant to ensure equal presentation of the electronic and paper offering. Users of the CSE were observed from a distance, without interruption, and their utilization behavior was recorded.

Behavior was recorded as to whether the user (1) read the paper or computer introduction first and, if paper, the number who then left without looking at the computer at all; (2) looked

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Table 1. Summary of Data

Raw Data	Corrected Data*
Users	Users
Total users: 77	Approached while computer was occupied: 10/77 (13.0%)
Approached while computer was occupied: 10/77 (13.0%)	Corrected total users: 67 (77-10)
What was viewed first	What was viewed first
Viewed computer first: 29/77 (37.7%)	Viewed computer first: 29/67 (43.3%)
Viewed handout first: 48/77 (62.3%)	Viewed handout first: 38/67 (56.7%)
Took handout without stopping: 21/48 (43.8%)	Took handout without stopping: 11/38 (29.0%)
Overall behavior	Overall behavior
Only viewed computer: 17/77 (22.1%)	Only viewed computer: 17/67 (25.4%)
Only viewed handout: 27/77 (35.1%)	Only viewed handout: 17/67 (25.4%)
Viewed both: 33/77 (42.9%)	Viewed both: 33/67 (49.3%)
Miscellaneous	Miscellaneous
Completed entire CSE: 7/77 (9.1%)	Completed entire CSE: 7/67 (10.5%)
Attempted to change system settings: 1/77 (1.3%)	Attempted to change system settings: 1/67 (1.5%)

Ten users were subtracted from the raw data because they represented the population of users who found the computer occupied and inaccessible, and may have been "forced" to view the paper presentation first, or perhaps even leave, without ever viewing the computer aspect of the exhibit.

only at the paper, the computer, or both presentations, during the entire time spent at the exhibit; (3) completed the entire CSE; or (4) attempted to change the computer system settings.

A priori, one could imagine the scenario of a second viewer approaching the CSE at a time when another was already using the computer, which could artificially increase the number of users who looked at the paper presentation first, perhaps never gaining access to the computer. Thus, such events also were recorded, and the raw data then were corrected by removing these second-arriving users from the study population.

Assumptions were made regarding CSE use and included the following: (1) Merely reading the title listed on the wall behind the workstation (present for every CSE) without looking at either the computer or paper introduction did not constitute CSE utilization, and these individuals were not included in the survey. (2) The observation periods (intermittent throughout 3 noncontiguous days) reflected an equal representation of the overall utilization during the entire time in which the exhibit was open. (3) After reviewing the CSE, participants did not return for a second time.

RESULTS

Data are presented in Table 1. Ten users were subtracted from the raw data because they represented the population of users who found the computer occupied and inaccessible and may have been "forced" to view the paper presentation first or perhaps even leave without ever viewing the computer aspect of the exhibit.

There were 67 total users, of which 91.0% were men and 9.0% women. Of these, 56.7% looked at the paper presentation first, of which, 29.0% left without ever viewing the computer presentation, whereas 43.3% viewed the computer presentation first. During the entire time spent at the exhibit

area, 25.4% looked only at the handout, 25.4% looked only at the computer, and 49.3% looked at both paper and electronic presentations when leaving the exhibit area. Thus, 74.7% eventually viewed at least a portion of the computer exhibit. Just 10.5% of all computer users completed the entire presentation. Only 1 individual (1.5%) attempted to change the system settings, and no one tried to access personal e-mail accounts.

There were 47 computer exhibits in the scientific exhibit area, 119 in the infoRAD exhibit area (for a total of 166 CSE), and 24,645 professional registrants (personal communication, Steve Drew, Assistant Executive Director, Scientific Assembly & Informatics, Radiological Society of North America). All CSE were open to the public for a total of 49.5 hours, during which the observation period for this study consisted of 16.5 hours (33.3%). Extrapolating the users observed, by the total time available, yielded 231 potential participants at the discussed exhibit, or 0.94% of the total professional registrants. Unfortunately, the total number of professional registrants who used all CSE or PSE is not available from the RSNA.

DISCUSSION

Jaffe and Lynch² recognized that learning radiology from computers should be "natural" for a specialty that relies heavily on computer-generated images, and that it "...is an ideal medium for classroom-independent training." Reviews have

unquestionably described computer-assisted instruction (CAI) as a great means of disseminating radiology images and education.²⁻⁴ Computer scientific exhibits (CSE) represent a clear and excellent example of CAI, yet only a single published report exists that discusses their construction or benefits,¹ and there have been no reports whatsoever evaluating the actual utilization of CSE during a meeting.

The advantages of CSE are numerous and clear. More data and images can be stored and presented from an electronic base than from a conventional poster scientific exhibit (PSE). In actuality, the limitation in the electronic setting is for viewer time, concentration, and workstation availability, and not the volume of subject matter within a given exhibit. With this as a consideration, care must be given during CSE construction not to include too much information, or user interest quickly may wane. Additionally, with electronic paths that are user chosen, only those subjects of specific interest will be displayed, bypassing other topics that the user may be familiar with or possibly has no interest in.

Although the RSNA now is beginning to repurpose some of their PSE in their databases, at most other symposia the PSE only have one-time usability. This conversion by the RSNA actually creates a CSE from PSE for website distribution and perusal. CSE also can be published elsewhere, such as on a CD-ROM or on a web page. A CSE is a "living" document because it can be modified and updated as newer facts or technology become available; PSE cannot. Such electronic exhibits also can be much more dynamic because presentation methods can incorporate movies and sound easily. Finally, although minor, transportation of a computer disc is far easier than old-fashioned poster tubes.

A disadvantage of CSE stems from its longer preparation time compared with PSE. Such presentations usually require a degree of programming knowledge, which the radiologist may or may not have. If not, additional collaborators with the ability to program become a necessity. Additionally, each CSE is limited to a single user, whereas PSE can allow as many users as its exhibit space will physically allow.

Some of these points have been reviewed previously by Varma et al.¹ In this 1994 review, the investigators also discuss the main uncer-

tainty of CSE, which is the willingness of the viewer to actually utilize CSE. They postulated that users might not wish to take the time to sit at a CSE because it may require more effort to view than a conventional PSE. In fact, with a CSE, the user may encounter a foreign interface with unknown buttons, mouse techniques, or even keyboards, that would require some period of learning just to view the exhibit. However, they believed that this problem would diminish as computer proficiency spread and computer interfaces became more natural.

Although the use of CSE has been added to some symposia and expanded at others, there has been no attempt in the literature to document the utilization patterns of CSE at a national meeting. The hypothesis of this project was that viewers still would prefer a more conventional paper presentation of a scientific exhibit over that of an electronic presentation. To test this, a nearly identical paper version of the introductory screen to a CSE was placed next to the workstation, and viewer habits were recorded at an infoRAD exhibit during the RSNA Scientific Assembly. Unfortunately, space limitations could not allow for duplication of the entire CSE in PSE format. In fact, dynamic elements were included within the CSE that would have been impossible to display in a PSE format.

The first behavior evaluated was that of user activity on first arriving at the CSE. In this case, a majority of users were first drawn to the paper presentation of the introduction rather than to the computer version. Of those who went to the paper presentation first, nearly one third left without ever looking at the computer. From these data, one can conclude that a majority of symposia registrants initially prefer a conventional paper presentation of introductory material. It is notable that even though a user had sought out the physical meeting space devoted only to computer exhibits, when offered a paper alternative, it was chosen frequently without the user ever viewing the computer presentation.

The next behavior recorded was whether the user viewed the paper presentation, computer presentation, or both, during the entire time spent at the exhibit space. This observation found an identical number of users who looked only at the paper versus only at the computer presentation. However, nearly half of all users eventually had perused both paper and computer presentations. Thus, although users, on first arrival, preferred the paper

presentation, about 75% eventually viewed at least a portion of the computer presentation. From this one can conclude that CSE have the ability to pique the interest of a majority of those who visit these exhibits, and suggests that their presence at national meetings is justifiable. It also must be realized that the participants observed were highly motivated to use a CSE, because they had actively sought the infoRAD physical space within an admittedly huge meeting space, and, thus, this may not reflect the attitude of the general RSNA registrant population.

Unfortunately, only about 10% of users went on to complete the entire exhibit. Reasons for not completing the entire exhibit are multiple. Interest in the topic may have waned while viewing, which is a commonplace occurrence with PSE as well. The subject material of this specific CSE may have turned out to be boring, or not of use, to viewers. Perhaps the user selected portions of the exhibit that were of specific interest to him or her, thus, allowing a more efficient use of the registrant's time. Lastly, potential users may have had insufficient computer training, resulting in an inability to interact with a foreign interface, thus, potentiating a growing frustration while viewing. Ten users were noted to have left after only taking a paper handout, without ever viewing the computer, at a time when the computer was occupied by a preceding visitor. This observation clearly shows the single-user limitation of CSE, which is a disadvantage that can only be overcome by the presence of multiple workstations displaying the same exhibit. This, however, would negate many advantages of CSE and is not a feasible alternative.

Because only a single user attempted to change system settings, and no one tried to access personal e-mail accounts, one can conclude that professional registrants are trustworthy and that constant manning of a CSE likely is unnecessary. Thus, perhaps manning the CSE only during defined question and answer periods would yield optimal use of the CSE author's time, allowing him/her/them to attend other concurrent portions of the meeting.

Limitations of this study include a small sample size, partly because of the inability of the author to observe the CSE during the entire time the exhibit area was open to registrants. Comparison with other CSEs would have been very helpful, because one could imagine that the degree of user partici-

pation is dependent on many subjective factors. This could include appearance of the exhibit, such as the colors, graphics, or images used. Additionally, behavior may be altered by influences as simple as geographic location: for example adjacent to, or furthest from, the entrance. At a meeting the size of the RSNA Scientific Assembly, this could become an important component of participation. It is interesting to note that the position of the infoRAD CSE used for this study was in a computer cluster furthest from the entrance. However, all of these factors would become less important if statistics were tabulated for several CSE. Lastly, even though an attempt was made to make the paper and computer presentations equivalent, they were not 100% identical. Content and appearance was slightly different, and the paper presentation was placed face-up on the adjacent countertop, which was not at the same viewing level or angle as the computer screen.

Producing and accrediting formal, planned continuing medical education (CME) events and activities are a large enterprise, and are underpinned by the belief that gains in knowledge will lead participating physicians to improve how they practice medicine. This, in turn, should positively affect patient care, which ultimately translates into improved patient morbidity and mortality and decreased health care cost. Unfortunately, findings clearly show that CME delivery methods such as didactic conferences, distributed reading materials, and PSE are not effective in changing physician habits.^{5,6} Conversely, these same findings show that CME modalities that include some form of interactive element which enhance participant activity and possibly provide the opportunity to practice skills can effect a change in professional practice and, in some cases, even health care outcomes.^{5,6}

To date, much has been written regarding the use of computers in medicine; the *Journal of the American Medical Association (JAMA)* has devoted an entire issue to it.⁷ As well, there is a robust body of research assessing the outcomes of CME; a dedicated journal (the *Journal of Continuing Education in the Health Professions*), as well as a university center and database (University of Toronto Faculty of Medicine, Centre for Research in Education) are devoted to the study of Health Professions CME. Unfortunately, neither discuss the CSE as an interactive CME alternative. One

could imagine that CSE may very well provide an ideal inexpensive CME resource, which by their inherent nature, may provide the necessary interactive component to positively effect outcomes; however, this has not been investigated and is yet to be proven. The results reported here show that CSE have the ability to pique the interest of a majority of those who visit these exhibits, and suggests that their presence as an alternative to PSE (which have no interactive value) at national meetings is justifiable. Thus, one could contend this provides a "first step" toward assessing outcomes impact by CSE, that of showing actual meeting participant interest, which also has not been reported previously. Future efforts will need to extend this analysis further to enlarge the sample size of the study performed, as well long-term follow-up of CSE participants to evaluate changes in physician clinical practice and any patient impact that may result.

Although PSEs have strict physical criteria within which they must conform that are established by an inviting society, similar limitations or standards do not exist for CSEs. Exhibits are commonly varied, cross platform, utilizing different interfaces, which can result in increasing frustration levels in all but expert computer viewers. Even though some CSE may require unique and custom hardware or software, these represent a distinct minority of exhibits. If the remaining CSE adhered to a predefined standard format that could include a single allowable platform and authoring software, the resultant standardized viewing environment would greatly facilitate user interaction with the CSE. In addition, the CSE then could be stored on a central server during the symposium and be selected by each user at a client workstation.

Such a configuration would obviate the greatest

drawback of CSE currently; that of a single user allowable per CSE, and it also would address current limitations on utilization such as physical placement and appearance. Likely, comfort levels with CSE would be improved, resulting in more CSE being fully utilized to completion. This also would allow for remote viewing of symposium exhibits by those unable to attend. Additionally, access requests to each CSE could be recorded throughout a meeting, and statistics could be generated as to individual CSE utilization as well as quantification of the types of CSE most desired by end users. Such information then could be used as selection criteria of CSE for subsequent symposia, selecting those types of exhibits most desired. At a minimum, subject trends of user interest could be tracked. If a standard format was constructed appropriately, included CSE could be repurposed easily into a database for postmeeting use; perhaps for issue on CD-ROM, as CME testing, or for web distribution.

CSEs have become commonplace at national meetings, accounting for 166 of the scientific exhibits at the RSNA Scientific Assembly. At this symposium, when presented with a paper alternative to the computer introductory screen, viewers, on arrival at an infoRAD CSE, preferred a more conventional paper presentation. Regardless, about 75% eventually perused at least a portion of the computerized portion of the exhibit. Although a small fraction of all RSNA registrants visited the CSE, the findings presented here are promising. The results of this study suggest that CSE presence at national meetings is justifiable and may provide a "first step" toward CME outcomes analysis, that of demonstrating actual meeting participant interest in CSE, which has not been reported previously.

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