

# Audiovisual Presentations on a Handheld PC Are Preferred As an Educational Tool by NICU Parents

P. Alur; J. Cirelli; M. Goodstein; T. Bell; J. Liss

WellSpan Health – Pediatrics, York, Pennsylvania, United States

## Keywords

Health literacy, patient communication, handheld computers, patient education, PDAs Summary

## Summary

**Background** Health literacy is critical for understanding complex medical problems and necessary for the well being of the patient. Printed educational materials (PM) have limitations in explaining the dynamics of a disease process. Multimedia formats may be useful for enhancing the educational process.

**Objective:** To evaluate whether a printed format or animation with commentary on a handheld personal computer (PC) is preferred as an educational tool by parents of a baby in the NICU.

**Methods:** Parents evaluated two formats: A 1-page illustrated document from the American Heart Association explaining patent ductus arteriosus (PDA) and animation with commentary on a handheld PC that explained the physiology of PDA in 1 minute. The reading grade level of the PM was 8.6 versus 18.6 for the audio portion of the animated presentation. Parents viewed each format and completed a four-item questionnaire. Parents rated both formats and indicated their preference as printed, animation, or both.

**Results:** Forty-six parents participated in the survey. Parents preferred animation over PM (50% vs. 17.4%.  $p = 0.02$ ); 39.1% expressed that the animation was excellent; whereas 4.3% expressed that the PM was excellent ( $p < 0.001$ ). The order of presentation of formats, sex, age, and educational level of parents did not influence the method preferred ( $p > 0.05$ ).

**Conclusion:** Parents preferred animation on a small screen handheld PC despite a much higher language level. Because handheld PCs are portable and inexpensive, they can be used effectively at the bedside with low-cost animation to enhance understanding of complex disease conditions.

## Correspondence to:

Pradeep Alur, MD, FAAP  
1001 S. George Street  
York, PA 17403 USA  
Phone: 717-851-2613  
Fax: 717-851-2602  
Email: palur@wellspan.org

## Appl Clin Inf 2010; 1: 142–148

doi: 10.4338/ACI-2010-01-RA-0005  
received: January 17, 2010  
accepted: April 21, 2010  
published: May 12, 2010

**Citation:** Alur P, Cirelli J, Goodstein M, Bell T, Liss J. Audiovisual Presentations on a Handheld PC Are Preferred As an Educational Tool by NICU Parents. Appl Clin Inf 2010; 1: 142-148  
<http://dx.doi.org/10.4338/ACI-2010-01-RA-0005>

## 1. Introduction

The parents of infants in the Neonatal Intensive Care Unit (NICU) are faced with unexpected emotional turmoil and they must very quickly assimilate a large quantity of information about their baby's condition that often includes unfamiliar medical language. They also are frequently asked to make critical decisions after being provided with information about complex disease conditions that is often written at a high reading level. Printed material is the most commonly used medium to help the parents of a baby in the NICU better understand their infant's disease conditions. Handouts developed by physicians are useful even in this age of easy access to information technology since they can help patients to differentiate facts from the misinformation widely available on the internet. One limitation of these materials is that they may not be the ideal medium to explain the dynamics of a disease to the parents. For example, the dynamics of the patent *ductus arteriosus* (PDA), a common congenital heart condition in premature infants, can be difficult for parents to comprehend. A multimedia presentation explaining the pathophysiology of the disease could be useful to enhance parents' understanding of PDA.

Desktop or laptop computers may serve this purpose, but are not ideal, as they may be expensive, large, and are not always available at the bedside. An alternative is the handheld personal computer, which is multimedia capable, portable, and widely used by physicians; however, the general perception is that their utility might be limited by the small screen size. We suspected that handheld personal computers might be useful in educating parents about complex disease states in their infants.

**The objective of this study was to** evaluate whether a printed format or an animation with an audio narrative on a handheld personal computer would be preferred as an educational tool by parents who have a baby in the NICU.

## 2. Methods

This was a cross-sectional study using convenience sampling comparing a one-page (8.5" x 11") illustrated information sheet about PDA with a brief animation (▶ Fig. 1) with a spoken narrative created using Phatpad® (Phatware Corp. CA, USA.) software. The information sheet was obtained from patient education material about PDA on the American Heart Association website [1]. The animation and commentary, created by the author, was presented on an HPC (HP iPAQ 4700x with a 4" screen and Windows Mobile 2003 second edition operating system ▶ Fig. 2]). Both formats described the pathophysiology of PDA. The multimedia presentation takes approximately 1 minute to view. Every participating parent was given both formats to review and then they were asked to complete a four-item questionnaire. The order in which both the formats were presented was alternated after each subject. Parents rated each format as not helpful, somewhat helpful, very helpful, or excellent. They indicated their preference as printed, animation, or both. Initial format viewed (paper or animation), parent age, sex, and educational level were recorded. Parents were asked if they understood and if they needed any further explanation at the end of reviewing each format. Flesch-Kincaid grade level was 8.6 for the printed education material and 18.6 for the audio portion of the multimedia presentation. Parents with prior knowledge of PDA were not included in the study. Analysis was done using chi square and independent sample t tests (SPSS v.16). The facility's Institutional Review Board approved the study.

## 3. Results

Forty-six parents participated in the survey. One parent chose not to participate in the study. Demographics of the participants are shown in ▶ Table 1.

Parents preferred animation (50%) to printed material (17.4%) and 85% of parents expressed understanding without additional explanation after seeing both formats. The order of presentation of formats, sex, age, and educational level of parents did not influence the method preferred by test

subjects ( $p>0.05$ ). Parents also rated the usefulness of both formats and 39.1% expressed that the animation was excellent; whereas 4.3% expressed that the printed format was excellent ( $p<0.001$ ).

## 4. Discussion

We sought to identify parents' preferred format in receiving information while in the NICU. There is little published work on this subject. One study evaluated handheld personal computers in patient education in 51 English-speaking HIV adult patients [2]. Participants of the study felt that handheld personal computer-based video was an appropriate medium for learning and they self-reported improvements in medication adherence, regardless of their baseline literacy skills. O' Hara et al, conducted a pilot study assessing the role of personal digital assistants to improve self-care in oral health [3]. Although 11 of the 36 enrolled patients had withdrawn, 40% of those remaining showed improvement in three areas of oral health. It is important to note that their study population had mild to moderate cognitive deficiencies. Many other researchers have successfully tested the utility of the handheld personal computer in patient education including adolescent education [4–9], but video was not deployed as a medium of patient education. A review article by Blake succinctly described the potential role of mobile technology in improving health education [10]. Adam Magos' group reported the use of patient's own surgery video clips in postoperative ward rounds and found greater patient satisfaction [11].

Realizing that a growing number of patients and their families were using video-capable media players, pediatric ENT surgeons at Massachusetts Eye and Ear Infirmary, created videos of pediatric ENT procedures for viewing on portable media players and cell phones [12]. These studies reflect the effort to utilize mobile technology in improving the health literacy of the patients and families.

In our study, parents clearly preferred low-cost animation to the paper format as the medium for education. This is particularly significant because the reading grade level (analyzed post-study by transcribing the audio, which resulted in a Flesh-Kincaid score of 18.6) of the audio portion of the animation was much higher than that of the printed educational material and well above the average grade level of our subjects. One weakness of our study was that the text of the two formats was different. The content of the two formats was equivalent. However, in order to describe the movement of blood in the dynamic audiovisual component, the verbiage was necessarily different from the text describing static drawings in the AHA handout. Thus, it is not entirely clear whether the preferences were based on manner of presentation versus textual differences. The preference for the audiovisual approach even though it has a much higher reading level demonstrates a benefit of the format.

The high level of educational attainment in our study subjects (13.8 years  $\pm$ 2.3) might be a potential limitation; however, research has shown that self-reported educational level consistently over predicts estimated reading level [13]. Moreover, there were no differences in the education levels of parents in regard to preference for either of the formats. Another weakness of the study is that we did not test the level of parents' understanding or recall after they reviewed both materials, as it may have been needlessly stressful to these already worried parents. Still, only 4% of parents required supplemental explanation after reviewing the audiovisual presentation as compared to 11% of parents after reading the written materials. Parents also rated the usefulness of both the formats and 39% expressed that animation was excellent, whereas only 4% expressed the same for the printed format ( $p<0.001$ ). These findings suggest that handheld PCs may play a significant role in explaining complex disease conditions for NICU parents and they may be deployed more widely not only to enhance parent's disease comprehension but also to assist with post-hospital care instructions. We speculate that a similar animation with a Spanish commentary could help in the Hispanic population by partially overcoming language barriers, and may help diminish the need for interpreters for some routine NICU parent education.

## 5. Conclusions

We have shown that an audiovisual presentation on a handheld PC was preferred by parents to written materials as a source of information about the patent *ductus arteriosus*. Handheld PCs have the potential to play a significant role in parent education in the NICU. Handheld PCs are portable and inexpensive and in widespread use and they can be used effectively at the bedside in the NICU. The animation and audio may enhance parents' understanding of the complex disease conditions of their babies. We speculate that animation may be particularly helpful for individuals with reading limitations and may facilitate health literacy. Similar benefits might reasonably be expected with other portable digital media such as laptops, netbooks, or computers on wheels. Further study with closely aligned written and audiovisual materials will help clarify the benefits of audiovisual formats, and the relationship between reading levels, presentation formats, and comprehension.

### Clinical Relevance Statement

Educating about complex diseases is an important aspect of provider-patient communication. Handheld PCs may help patients and their families better understand complex disease conditions. Animation with audio may be useful as an educational tool in overcoming the barriers of learning disabilities and language.

### Acknowledgement

We are very thankful to Ms. Kate Kelly, Emig Research Center, WellSpan Health, for her excellent support and help with the manuscript.

### Conflict of Interest

All authors disclose that they do not have any financial and personal relationships with other people or organizations that may inappropriately influence or bias the objectivity of submitted content and/or its acceptance for publication in this journal.

### Protection of Human Subjects and Animals in Research

All the authors indicate that the procedures used have been reviewed in compliance with ethical standards of institutional review board on human experimentation and with the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects.

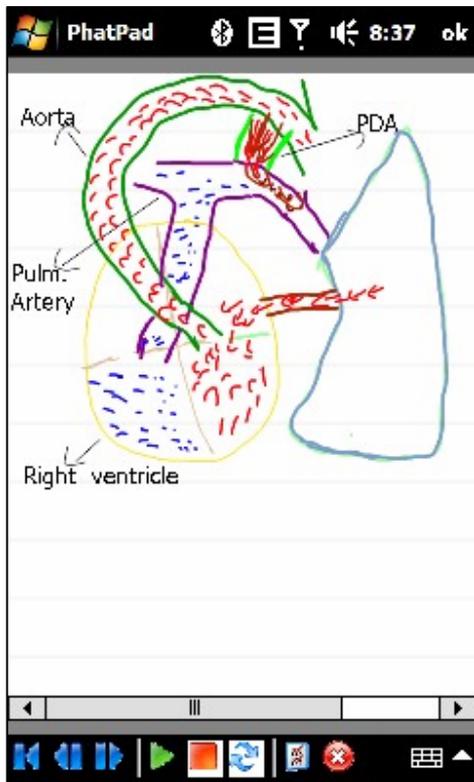


Fig. 1 Snapshot of animation preferred by the parents.

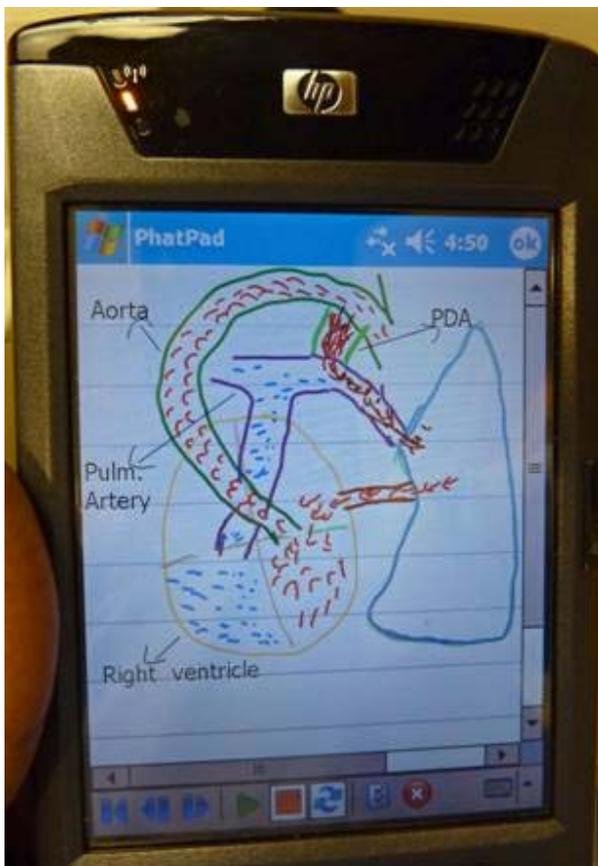


Fig. 2 Handheld PC with 4" screen used as an educational tool.

**Table 1** Demographics of the participants

Male	39.1%
Female	60.9%
Age in years, mean (standard deviation)	29.7 (7.1)
Average education in years, mean (standard deviation)	13.8 (2.3)
Animation preferred*	50%
Printed preferred*	17.4%
No preference	32.6%
Viewed paper first	52.2%
Viewed animation first	47.8%
*p = 0.02	

## References

1. American Heart Association [Internet]. Patent ductus arteriosus. Updated May 26, 2009. Available from: <http://www.americanheart.org/presenter.jhtml?identifier=1672>.
2. Brock TP, Smith SR. Using digital videos displayed on personal digital assistants (PDAs) to enhance patient education in clinical settings. *Int J Med Inform.* 2007; 76(11-12): 829-835.
3. O'Hara DM, Seagriff-Curtin P, Levitz M, Davies D, Stock S. Using personal digital assistants to improve self-care in oral health. *J Telemed Telecare* 2008; 14(3): 150-151.
4. Sevick MA, Zickmund S, Korytowski M et al. Design, feasibility, and acceptability of an intervention using personal digital assistant-based self-monitoring in managing type 2 diabetes. *Contemp Clin Trials* 2008; 29(3): 396-409.
5. Fukuo W, Yoshiuchi K, Ohashi K et al. Development of a hand-held personal digital assistant-based food diary with food photographs for Japanese subjects. *J Am Diet Assn* 2009; 109(7): 1232-1236.
6. Sevick MA, Piraino B, Sereika S et al. A preliminary study of PDA-based dietary self-monitoring in hemodialysis patients. *J Ren Nutr* 2005; 15(3): 304-311.
7. Ma Y, Olendzki BC, Chiriboga D et al. PDA-assisted low glycemic index dietary intervention for type II diabetes: a pilot study. *Eur J Clin Nutr* 2006; 60(10): 1235-1243.
8. King AC, Ahn DK, Oliveira BM, Atienza AA, Castro CM, Gardner CD. Promoting physical activity through hand-held computer technology. *Am J Prev Med* 2008; 34(2): 138-142.
9. Olson AL, Gaffney CA, Hedberg VA, Gladstone GR. Use of inexpensive technology to enhance adolescent health screening and counseling. *Arch Pediatr Adolesc Med* 2009; 163: 172-177.
10. Blake H. Innovation in practice: mobile phone technology in patient care. *Br J Community Nurs* 2008; 13(4): 160-165.
11. Magos A, Sharma M, Buck L. Handheld computers in clinical practice. *BMJ* 2004; 328(7455): 1565.
12. Abreu DV, Tamura TK, Sipp JA, Keamy DG, Eavey RD. Podcasting: contemporary patient education. *Ear Nose Throat J* 2008; 87(4): 208, 210-211.
13. O'Bryant SE, Lucas JA, Willis FB, Smith GE, Graff-Radford NR, Ivnik RJ. Discrepancies between self-reported years of education and estimated reading level among elderly community-dwelling African-Americans: analysis of the MOAANS data. *Arch Clin Neuropsychol* 2007; 22(3): 327-332.