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**HIV EDUCATION USING CLINICAL CASE SIMULATION**

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**Background:** The lack of trained health care workers (HCW) is a critical barrier to expanding antiretroviral therapy to address the global HIV pandemic. Available training methods such as instructor led courses are too expensive to expand to the scale needed, provide a passive learning experience, and/or do not provide real-time detailed assessment of knowledge gained. We report on performance and user satisfaction criteria using an interactive web-based electronic simulated patient program that allows practitioners to manage virtual HIV patients

**Methods:** Six virtual patient histories were created using interactive educational software and actual patient data to allow clinicians to work through the management of simulated HIV patients. Participants were provided histories, photographs, and laboratory tests as requested, and were able to diagnose new diseases, order tests and treatments, and devise care plans. Advice and warnings were offered during the simulation, and an educational summary, including scores and a breakdown of any warnings, was provided at completion. Published treatment guidelines from IDSA, CDC, DHHS, WHO and others were used to assess the appropriateness of management choices and provide feedback. Time spent and user satisfaction with this training tool was recorded.

**Results:** The average case required 15 minutes to complete. Of the 744 clinicians from 34 countries completing 1,410 sessions, 71% completed 2 or more cases, and 92% finished any case started after completing their first one. While Caribbean participants demonstrated the highest average scores (most scored >90%), scores and time spent otherwise were virtually identical between USA and international participants. The survey revealed that 97% were satisfied or very satisfied with the activity and that 98% considered simulation to be a valuable addition to clinical educational training.

**Conclusions:** Using an internet-based clinical simulation program, it is possible to provide HIV training globally at low cost and with high clinician interest and acceptance.

**INTRODUCTION**

As global cases of AIDS approach 50 million, systems attempting to keep pace with the educational needs of clinicians in multiple regions have been severely taxed. Experts from various national and international organizations have been training physicians from many different countries in the effective treatment of HIV for years. Though successful, the traditional training methods employed have not been able to expand the cadre of HIV-ready clinicians at the pace required to meet the demands of the epidemic on an international scale. To meet the global need for qualified HIV care providers, it is essential that new training tools and methods be developed. Electronic-based programs have the potential to dramatically increase the number of clinicians who can be trained simultaneously at multiple locations with substantially less cost. However, most existing web-based programs are limited by not reflecting the complexity of the HIV diagnostic and treatment process and by a mere 20% completion rate.

In this study, six virtual patient histories were created using novel interactive educational software and actual patient data to allow clinicians to work through the management of simulated HIV patients. These cases have been available since March 2005 as three cases in each of two different Internet sites. The software tested uses expert systems technology to create a fully interactive clinical simulation environment with immediate advice, feedback and links to authoritative reference documents. A clinician can order labs, make a diagnosis and develop a treatment path. Compliance with established guidelines for diagnosis, treatment, prophylaxis, drug interactions and dosing are recorded as a score in the end session evaluation. Finally, a satisfaction survey is offered.

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**Target Audience:** HIV educators and HIV clinicians (novice to experienced)

**Goals:** Increased number of HIV-proficient clinicians and Improved quality of HIV care

**Tool:** Novel HIV clinical simulation software program and mimics electronic medical record  
Web-based, fully interactive and supplements traditional training approaches

**Sources of Authority:** Respected drug database (doses, toxicity, etc.); Guidelines (DHHS, CDC, WHO, IDSA/HIVMA); Journal articles and conference abstracts; ID Clinician oversight

**Strengths of the tested Clinical Case Simulation tool:**

Available anytime online; not timed; useful for education and/or testing;  
Accepts cases of varying complexity; instant clinical feedback and advice;  
Links to authoritative guidelines and articles; ends with an educational summary  
(references, scores and warnings);  
Satisfaction survey.

**Components of Clinical Case Simulation (7 sections, in order):**

Introduction—with pictures(s)  
History—hours to years  
Order Tests—choice of several  
Test History—cumulative results  
Diagnosis—from list of several hundred  
Orders—drugs, diets, consults, etc.  
End Session—summary, warnings, scores, and references

## SIX CLINICAL CASE EXAMPLES: TWO INTERNET SITES

1. 33 y.o. man; CD4 316/ HIV-RNA 91,000; naïve; NNRTI resistance
2. 42 y.o. man; seborrheic dermatitis; hyperlipidemia and lipoatrophy
3. 32 y.o. woman; thrush; salvage; CD4 74 (declining); HIV-RNA 118,000
4. 33 y.o. man; treatment naïve; CD4 178/ HIV-RNA 21,000; acute zoster
5. 27 y.o. woman; candida esophagitis; failing regimen
6. 56 y.o. man; viro-/immunologic failure; resistance

<u>RESULTS</u>	6 wks. (%) 5/6/2005	6 mo. 9/15/2005
Time (minutes) average	15	17
Time of "good" sessions	21	21
Participants (number)	1,204	1,705
Completed at least one case	744 (62)	1,035 (61)
Completed 2 or 3 cases	528 (71)	n/a
Completed all cases after 1 <sup>st</sup>	486 (92)	n/a
Sessions started	2,104	2,763
Sessions completed	1,410 (67)	1,847 (67)
Countries participating	55	95
African countries participating	9	21
Countries finishing at least 1 case	34 (62)	59 (62)
Average # cases/user finishing one	1.9	1.7
Scoring >90% at end session by region:		
Caribbean (4 sessions)	75%	n/a
US, Europe, S. America, Asia (8-65 sessions)	14-25%	n/a
Satisfied or very satisfied with activity:	97%	n/a
Simulation valuable for clinical training	98%	n/a

## SELECTED ERRORS (5/6/2005)

Ordered ART when indicated	566/1,117	(52%)
ART use dosing errors	238/566	(42%)
d4T dosing errors	6/16	(38%)
ddI dosing errors	9/24	(38%)
Used PCP prophylaxis when indicated	132/396	(33%)
Treated hyperlipidemia when indicated	84/390	(22%)
Treated fungal infections when indicated	267/464	(58%)
Treated <i>Herpes zoster</i> when indicated	16/53	(30%)

## CONCLUSIONS

### Clinical Case Simulation can:

- Simulate complex HIV cases
- Provide instant advice, feedback and evaluation
- Reach participants globally\*\*
- Demonstrate user convenience at a low cost
- Generate high clinician interest and acceptance
- Uncover discordances between published guidelines and clinical choices.

### By 9/05, Participants Represent 95 Countries

- ❖ USA, Canada
- ❖ Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Grenada, Guatemala, Jamaica, Mexico, Panama, Peru, Trinidad and Tobago, Uruguay, Venezuela
- ❖ Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK
- ❖ Angola, Botswana, Cameroon, Congo, Gambia, Ghana, Kenya, Lesotho, Mali, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Seychelles, Somalia, South Africa, Sudan, Tanzania, Zambia, Zimbabwe
- ❖ Armenia, Bahrain, Bangladesh, Bhutan, China, Hong Kong, India, Iran, Japan, Jordan, Kuwait, Macedonia, Nepal, Pakistan, Qatar, Russian Fed, Saudi Arabia, Slovenia, Sri Lanka, Syria, Taiwan, UAE, Ukraine
- ❖ Australia, Fiji, Kiribati, Malaysia, New Zealand, Singapore, Thailand, Philippines, Vietnam