
HMA

HEALTH MANAGEMENT ASSOCIATES

Feasibility Study for a Colorado Center for Virtual Health Care
Education

PRESENTED TO
REGIS UNIVERSITY AND THE COLORADO HEALTH FOUNDATION

FEBRUARY 26, 2013

*Research and Consulting in the Fields of Health and Human Services Policy, Health Economics
and Finance, Program Evaluation, Data Analysis, and Health System Restructuring*

ATLANTA, GEORGIA • AUSTIN, TEXAS • BOSTON, MASSACHUSETTS • CHICAGO, ILLINOIS • COLUMBUS, OHIO
DENVER, COLORADO • HARRISBURG, PENNSYLVANIA • INDIANAPOLIS, INDIANA • LANSING, MICHIGAN • NEW YORK, NEW YORK
OAKLAND, CALIFORNIA • SACRAMENTO, CALIFORNIA • SOUTHERN CALIFORNIA • TALLAHASSEE, FLORIDA • WASHINGTON, DC

TABLE OF CONTENTS

| | |
|---|-----------|
| Introduction | 1 |
| About the Feasibility Study | 2 |
| Phase I Study Findings | 4 |
| The National Context and Colorado Use of Simulation | 4 |
| Attitudes toward Virtual Simulation as a Clinical Tool | 6 |
| Attitudes toward Collaboration and a Center | 9 |
| The Value Proposition for Virtual Simulation and the Center | 11 |
| Observations and Conclusions | 13 |
| Appendix | 14 |
| Interviewees | 15 |
| Stakeholder Meeting Participants | 16 |
| Stakeholder Webinar – Link | 17 |
| Stakeholder Meeting Agenda | 18 |
| Framework for Virtual Simulation and Clinical Education | 20 |
| Center Model | 24 |
| Works Cited/ Referenced | 25 |

INTRODUCTION

Colorado, like other states, has experienced challenges to educate its health care workforce, a workforce prepared to appropriately care for diverse populations in the context of an evolving health care system. In the face of intensified demands on clinical practitioners in both inpatient and ambulatory care settings, educators and clinical leaders are calling to redefine what constitutes adequate entry level clinical preparedness. New competencies endorsed by the Institute of Medicine (IOM) require that students now be prepared with skills for patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics.

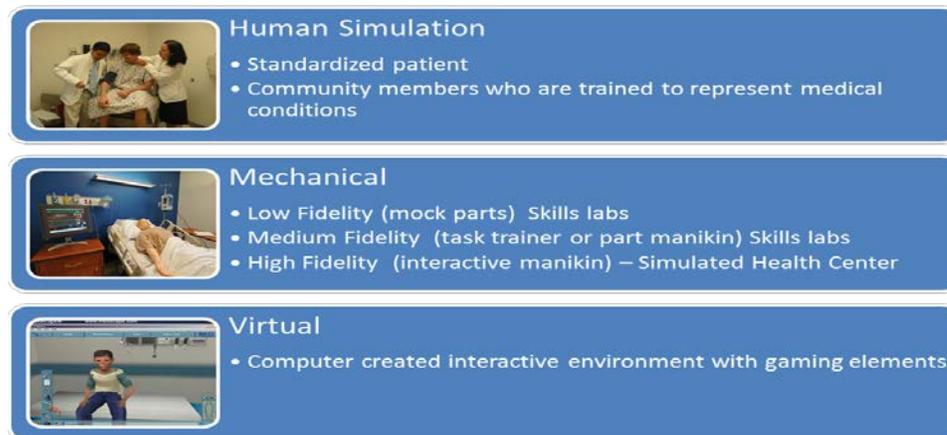
Meeting the challenges of clinical education are particularly vexing for nursing, where demands for additional graduates to meet workforce shortages have strained the limits of academic and clinical institutions and the current clinical learning model. State regulators require schools to provide a certain number of clinical hours for all students. Educational pathways to licensure are diverse, and geographically dispersed. Despite the desire to do so, providing inter-professional education is extremely challenging to orchestrate. Over the last decade, attempts to increase the number of nurses prepared for clinical practice have been stymied by lack of clinical faculty and struggles to secure clinical experiences in settings appropriate for each of required clinical areas. In the face of uneven exposure and opportunities to practice, students have limited opportunity to acquire the kinds of complex assessment and decision-making skills required by real time clinical scenarios.

In recent years, the use of simulation has taken hold as a solution for improving clinical education and readiness to practice across Colorado's health care academic and clinical institutions. Simulation is a proven technique "..... to replace or amplify real patient experiences with guided experiences, artificially contrived, that evoke or replicate substantial aspects of the real world in a fully interactive manner." (Gaba, 2004). The benefits of simulation are acknowledged to be the opportunity to practice without risk to patients, flexibility in design to address skills ranging from simple to complex and the entry level or advanced practitioner, and the opportunity for repeated practice and assessment of essential skills.

Various forms of simulation are being promoted and are used today in the health professions including human simulation (i.e. standardized patients), low and high fidelity simulation (ranging from task trainers to interactive mannequins), and to a lesser degree, virtual simulation. Virtual simulation involves a computer created environment that can support repeated interactive practice and assessment by individuals alone or in groups. Virtual simulation includes screen-based simulations, web-based multi-site case studies, and serious gaming – games for an educational purpose. As a recreational past time, virtual gaming is increasingly popular and games are played anywhere and anytime on mobile devices. After long-standing

acceptance in other industries and professions e.g. the training of pilots, the potential of serious games to augment health professions education is now gaining serious attention.

Figure 1. Simulation Environments - Human, Mechanical, Virtual



About the Feasibility Study

Regis University received a grant from the Colorado Health Foundation to support a two part feasibility study (Study) of a Colorado Center for Virtual Health Care Education (Center) that would promote the development and use of virtual simulation and serious games as part of health professions education. The genesis of this effort grew out of experiences by administrators and faculty in the nursing, physical therapy and pharmacy pre-licensure programs at the Rueckert-Hartman College for Health Professions (RHCHP) of Regis University. Despite using low and high fidelity simulation with its students, RHCHP perceived that difficulties securing adequate clinical placements would continue and that the use of virtual simulation, particularly serious games, could be extremely effective as part of clinical hours to address objectives for the acquisition of clinical competencies. Based on preliminary investigation, Regis leaders speculated that a Center could serve as a dedicated source of leadership and resources in Colorado. Its purpose would be to develop and integrate virtual games and other virtual simulation as part of clinical experience for all Colorado health professions, starting with nursing, pharmacy and physical therapy. As Figure 2 illustrates, determining the feasibility of establishing a Center was organized as a two part investigation.

Figure 2. Feasibility Study - Two Phases

| Phase I | Phase II |
|---|---|
| Preliminary framework Environmental scan <ul style="list-style-type: none"> • Regulatory framework • Stakeholder interest and priorities • View of collaboration and a “Center” | Learning objectives -content priorities Technology implications Center options Business plan Partnerships |

Methodology

HMA was retained to work on Phase I activities in partnership with a RHCHP Study project team. This team included an advisory committee made up of faculty and administrators from the Regis nursing, pharmacy and physical therapy programs. HMA's role was to conduct an environmental scan and collect input from stakeholders to help support conclusions about whether or not it would be feasible to proceed with Phase II study activities.

Questions to be answered in Phase 1 included:

- What is being done in Colorado regarding virtual simulation in the context of other simulation?
- What is the attitude of faculty or administrators toward virtual simulation as a clinical tool?
- What is the attitude towards collaborating with other schools regarding development of a center that would address the clinical crisis? Is there support for Regis University being the sponsor or host of the center?
- How will potential partners in a Center measure the value of participating in the Center and integrating serious games as part of clinical education? How difficult will it be to develop methods to track clinical costs and share these with other collaborators?

The RHCHP Study project team conducted additional investigation of the regulatory framework in Colorado to support the increased use of simulation as part of required clinical hours. A summary of these findings is provided separately. Key tasks included background research, collecting stakeholder input, and a report of key findings. In light of a compressed project timeline, HMA's approach was to be resourceful and targeted in its efforts. Targeted steps were taken to develop a working understanding of the landscape of virtual simulation and game-based learning in the health professions relative to the objectives of the study. These included a targeted literature review and dialogue with two preeminent national experts in the development and application of serious games for health professions education.

The deliberations of the Study's Advisory Committee were organized and drafted into a framework for Colorado educators to consider relative to the potential for virtual simulation as part of clinical education and the role of a Center in Colorado. Contacts were made and fifteen interviews conducted to leverage insights from leaders of past and current simulation efforts in Colorado and to understand the current experiences and perspectives of a select number of Colorado nursing, physical therapy and pharmacy academic institutions and faculty.

The first of two stakeholder meetings to facilitate stakeholder engagement and dialogue was held virtually on January 22, 2013 to take advantage of the availability of the Study's two national expert advisors: Mary E. Mancini, RN, PhD, Professor and Associate Dean for Undergraduate Nursing Programs, Baylor Professor for Healthcare Research, The University of Texas at Arlington College of Nursing, and President, The Society for Simulation in Healthcare; and Marjorie A. Zielke, Ph.D., Assistant Professor of Arts and Technology, and Associate Director, Institute for Interactive Arts and Engineering at The University of Texas at Dallas. These two

prominent national experts provided an overview about the growing application of virtual simulation and serious games to address clinical learning and the acquisition of necessary competencies for health professions education. Administrators and simulation faculty from Colorado's baccalaureate nursing, physical therapy, and pharmacy programs participate as well as the community college representative from the Colorado Association of Nurse Educators and a representative from the Colorado Center for Nursing Excellence. The Appendix provides a link to an archive of the webinar, which included a lexicon about virtual simulation and games.

The webinar event set the stage for a second in-person group discussion regarding the potential value and feasibility of faculty and academic programs working together to develop and use virtual simulation and serious games via an organized Center. Invited stakeholders from Colorado's nursing, pharmacy and physical therapy programs reviewed again engaged in dialogue during a half day meeting held on the Regis campus. The twenty-five attendees included a mix of program administrators and simulation faculty from across the state, including urban and rural BSN nursing programs, a representative of the Colorado Community Colleges ADN programs, Regis and University of Colorado physical therapy and pharmacy programs, and the RHCHP Study Advisory Committee.

PHASE I STUDY FINDINGS

Key themes emerged from background research and conversations with national leaders, Colorado faculty and administrators. In one on one interviews and group discussions, Study participants provided input about current clinical education, uses of simulation, and views about expanding the use of virtual simulation and particularly games as part of clinical experiences. Taken together, the following observations provide a sense of the Colorado environment related to the development of virtual simulation as a clinical education resource, and the concept of a Center. The synthesized findings are organized to address the Phase I study questions.

The National Context and Colorado Use of Simulation

In the *broad national context*, workforce is receiving attention on several fronts as part of delivery system reforms. The IOM issued a recommended set of desired competencies for all health professionals that require significant re-tooling of approaches to education. As part of dramatic shifts in the health care landscape, an emphasis on primary care (for example, patient centered primary care homes or PCMH) features inter-professional teams and nurses in prominent roles as care managers. Across acute and ambulatory care, delivery systems are positioning themselves for payment reform and being able to demonstrate evidenced-based care and cost-effective patient outcomes. Hospitals are seeking the advantages of achieving magnet status to demonstrate their quality and value, generating additional pressures on workforce to be capable of complex care management and decision-making skills. Since levels of practice readiness are an issue, hospitals are considering strategies such as nursing residencies to prepare its en-

try-level workforce. Background research points to all of these forces for change being at work, both nationally and in Colorado, generating pressure and opportunities for changes in how nurses and other health professionals are educated.

Simulation has gained considerable momentum as part of health care education. As evidence of broad adoption of human, low and high fidelity simulation in both pre and post-licensure education, “simulation centers” of various sorts are attached to academic centers, specific academic programs, and clinical facilities across the country. Nationally and internationally, well-organized efforts are actively promoting the use of simulation. One prominent example is leadership by The National League of Nursing (NLN) to offer significant resources to nursing educators and practitioners through its Simulation Innovation Resource Center (SIRC). The SIRC is an online e-learning site where nursing faculty can learn how to develop and integrate simulation into their curriculum, and engage in dialogue with experts and peers. The Society for Simulation, International Nursing Association for Clinical Simulation and Learning and other international organizations are also highly active in inter-professional efforts to foster the development and use of effective simulation. As referenced during the project’s recent webinar and evident by reviewing the literature, a cadre of nursing researchers are working to expand an evidence base for the use of simulation in health professions education. As highlighted during the Study’s webinar, significant investments are being made by federal agencies, including the military, to develop educational gaming. Simulation vendors, such as Laerdal, have been prominent in the development of high fidelity simulation resources. Their role in developing virtual simulation and the status of this marketplace is not clear, particularly related to game-based resources. For example, Laerdal developed an early computer-based micro-simulation product, but, based on the experience of one Colorado nursing program, product support was discontinued.

Colorado mirrors a nationwide trend, particularly among nursing educators, looking to simulation as a solution to address increasing difficulties securing adequate clinical placements and providing clinical experiences for pre-licensure students. *Notable efforts in Colorado* to support the use of human, low and high fidelity simulation for health professions clinical education are simulation centers that provide experiences for University of Colorado medical, physical therapy, nursing and pharmacy students on the Anschutz Campus. These include the Center for Advancing Professional Excellence (CAPE) and the Work Education and Lifelong Learning Simulation (WELLS) Center. CAPE offers an array of human simulation and high fidelity experiences to health professions students. The WELLS Center, initially established through a collaborative effort between the Center for Nursing Excellence and the Colorado Department of Labor, also offers a high fidelity laboratory and training and technical consulting to inter-professional teams from the University of Colorado Hospital, educators and health care organizations. In addition, widespread investments have been made by nursing schools across the state in simulation labs and resources. However, while various levels of simulation - standardized patients and low and high fidelity - are prevalent nationally and in Colorado, there appears to be *wide variation across programs* in when and how simulation is used as part of clinical coursework, ranging in numbers of days per course and approaches with students.

There are *hot spots of leadership for innovation in health professions education in Colorado* building on national and local initiatives and the interests and motivation of key institutions, organizations and individuals. The University of Colorado at Denver is involved as one of fifteen schools participating in Phase III of the Quality and Safety Education in Nursing project sponsored by the Robert Wood Johnson Foundation. This project is targeting faculty development in key states to advance the teaching of new competencies. The Colorado Center for Nursing Excellence currently leads an initiative to provide training in home health care management using simulation. Local foundations are playing a role to expand simulation in rural programs. A grant from the Caring for Colorado foundation is expanding collaborative efforts between the nursing programs of University of Colorado at Colorado Springs (UCCS) and Lamar Community College in south east Colorado by funding the enhanced technical capacity to stream live video of UCCS simulation lab sessions. This enables Lamar community college associate degree nursing students to participate via long distance in the UCCS simulation lab, and is part of linking the associate degree in nursing (ADN) with the bachelor of science in nursing (BSN) degree program.

Attitudes toward Virtual Simulation as a Clinical Tool

During interviews and discussion during stakeholder meetings, a mixed group of program administrators and faculty shared their experiences and issues related to the clinical education of their students and their current use of simulation. They also commented on the potential for virtual simulation, and particularly game-based simulations, to address current gaps in clinical education, and how they could imagine virtual simulation being incorporated as part of clinical experience during pre-licensure programs.

Overall, both program administrators and faculty shared consistent views about the need for change, the potential for virtual simulation, and factors that must be addressed to realize the integration of new forms of clinical learning and their positive impacts.

Gaps in Clinical Education

Most broadly, Study informants emphasized that current approaches are not adequately preparing students to meet the clinical competencies required to practice in today's increasingly complex health care environment. They recognized that a critical priority is making the shift to a competency focus in health professions education and there is an urgent need to enhance student readiness, particularly for inter-professional team-based roles.

Colorado nursing, physical therapy and pharmacy programs vary in the degree of challenges they currently report about arranging and supporting clinical placements for their students. Informants from nursing programs agreed that the work to negotiate and pay for clinical placements, often in competition with other programs, is becoming more onerous. Rural program faculty related that their students are required to travel long distances and stay away from

home for days at a time to take advantage of placements that are only available outside their local communities. Additionally, securing adequate numbers of qualified clinical faculty and ensuring the consistency and quality of instruction is another major concern.

Informants agreed and emphasized that the current approach of relying on high fidelity simulation to augment what students learn from clinical placements has not addressed the gaps in clinical experiences. Faculty consistently cited gaps in exposing students to “high risk – low volume” clinical experiences – types of scenarios with high risks to patients but occurring with low frequency so students would be unlikely to see them as part of routine clinical placements. Examples include acute stroke, myocardial infarction and post-partum hemorrhage. Faculty pointed to obstetrics and pediatrics as clinical placements of particular concern. They related that high fidelity lab-based simulations are helpful but limited: physical simulation laboratory sites have limits on the numbers of students who can access them, create scheduling challenges, and require faculty to be on-site. Efforts to orchestrate consistent and meaningful inter-professional clinical experiences have been particularly challenging.

The Potential for Virtual Simulation

Based on their understanding of virtual simulation and computer-based games, Study informants pointed to several ways that virtual simulation and game-based scenarios would significantly enhance clinical education:

- Assessing competencies rather than tasks. Interactive scenarios could assess the ability of students to integrate and apply what they learned, and measure the degree to which they demonstrate clinical reasoning and complex decision making skills.
- Generating data. Computer based programs can capture data that measures whether students demonstrated knowledge and decision-making, for example, comprehensiveness and timing of their assessment and decision making relative to a clinical scenario.
- Benchmarking. The ability to capture data allows students, faculty and administrators to understand how students perform against benchmarks for clinical competencies required at different levels of practice. These benchmarks would enable consistency in measuring competencies, going beyond the pass/fail rates of examinations. Benchmarks can be tied to licensure test components such as those included in the National Council Licensure Examination (NCLEX) for nurses.
- Testing and Remediation. Feedback can be provided to students to enable them to practice until achieving mastery. Faculty can use data to provide guidance to students.
- Research and curriculum development. The ability to capture data, and manipulate learning scenarios provides faculty and researchers to assess the effectiveness of learning methods and tools, and develop innovations in curriculum to address targeted learning needs.

In addition to these dimensions, informants pointed to several compelling aspects of using virtual simulation and gaming to expand and enhance learning experiences and outcomes for students, faculty and academic institutions.

- Greater consistency of clinical learning experiences for all students. Faculty still coach and guide, but learning content and expectations are more standardized, rather than reliant on uneven content and methods among diverse clinical instructors. Using virtual

simulation has the potential to raise the bar statewide for clinical judgment and attaining competencies.

- Preparing students for real world clinical environments. Students would have the opportunity to understand and prepare themselves for the stress of decision-making in real clinical scenarios.
- Improving student's access to clinical learning experiences, especially for rural students. Rural students would gain access to an expanded array of clinical learning experiences that can be accessed regardless of location. All students would have greater access to self-paced learning to improve their likelihood of mastery.
- Strengthening clinical faculty. Virtual simulation provides the opportunity for more structured and consistent clinical preceptor training and evaluation.
- Lowering faculty cost and workload. Using virtual simulation resources provides the opportunity to restructure how clinical and adjunct faculty are used. Faculty to student ratios could be increased. Using computer supported learning scenarios would enable more flexibility for students individually and in groups to access and participate in learning activities.
- Targeting inter-professional team skills, new practice models. Interactive games can expose and provide practice for students to understand the team dynamics that are part of clinical practice, target specific scenarios, and engage students in "synchronous" learning scenarios, including those that apply outside of acute care setting e.g. primary care, community health, behavioral health.
- Fostering innovative institutional and programmatic relationships. The use of shared virtual simulation resources can accelerate and expand opportunities for academic institutions to forge learning partnerships and pursue opportunities for program enhancements, for example ADN to BSN.

Integrating Virtual Simulation and Gaming into Clinical Hours

Overall, for all the reasons cited above, contributors to the Phase I Study expressed enthusiasm about the potential of virtual simulation to strengthen health professions clinical education and competencies. During one-on-one interviews, some administrators expressed cautious interest about the potential to substitute virtual simulation for actual clinical hours, admitting that their views are colored by the challenges they anticipate related to an initiative of this significance such as resource constraints and managing additional demands on faculty. Some faculty informants, during initial interviews, admitted that they didn't have much knowledge or a concept for how the use of virtual simulation would work in practical terms as part of their program.

However, after the webinar and during stakeholder discussions, the level of enthusiasm about using virtual simulation games as part of clinical experiences was high. During discussion, it was emphasized that recent actions by nursing regulators in Colorado allow for flexibility and opportunity related to the use of clinical hours.

Participants noted that many options would be possible for how and when to use various virtual simulation resources, but that many issues must be addressed to support design, training and implementation of new approaches to clinical learning. These issues include having institutional supports and "champions", ensuring the engagement of and supports for faculty development. Some offered that a good case can be made for structuring virtual simulation pilots

as a way to design, train and incrementally implement new approaches to clinical experiences. Administrators and faculty simulation coordinators expressed being eager to learn more and to begin working to figure out practical options for working with virtual simulation in their programs.

Priorities for Development

Study informants offered perspectives on how to prioritize the development of virtual simulation games and scenarios. Certain clinical areas were “top of mind,” mentioned by faculty during one-on-one interviews and during group discussion. These included:

- medical-surgical areas
- obstetrics
- pediatrics
- home care

In addition to these specific areas, several other priorities for developing virtual scenarios had widespread support from the stakeholders.

- cases tied to NCLEX test categories
- prioritization and organizational skills
- high stakes testing of clinical judgment
- managing multiple patients
- help students define their role in the health care setting i.e. inter-professional, team-based scenarios
- develop characters like “the Neighborhood” that go across specialties
- scenarios focused on safety and quality, preparing students before going into clinical sites (e.g. high risk, low volume – scenarios of high risk to patients but not frequently encountered in practice)
- demonstrate mastery in virtual settings, then allow students to go into clinical sites

Attitudes toward Collaboration and a Center

One of the overriding themes that emerged from stakeholder interviews and group discussion was the need to work collaboratively to make the changes being contemplated to traditional clinical education. Many of the Study informants shared their experiences as individual champions for innovation and what they had been able to achieve related to simulation within their particular institutions. They acknowledged the incremental steps that have been taken in Colorado to strengthen health professions education more broadly. Examples include adoption of the Clinical Scholar model for clinical preceptors, the widespread use of human and/or high fidelity simulation to some degree as part of pre-licensure programs, and resource sharing among institutions and the evolving partnerships and integration of ADN and BSN programs.

However, Study informants also acknowledged that positive changes have been uneven and slow to disperse at local levels, that their individual efforts implementing simulation have in many ways been limited, and that sustaining other collaborative initiatives in Colorado has

proven challenging. They cited experiences related to the Wells Center, a broad collaboration that dissolved when the matter of financial sustainability and the need for financial investments by individual institutional participants became an issue. These same circumstances – the need for individual collaborative participants to restructure their business models, resource allocations, and ways of managing clinical education - influenced the dissolution of another initiative operated by the Colorado Center for Nursing Excellence focused specifically on arranging collaborative sharing of clinical placements.

Given these experiences, stakeholders nonetheless emphasized that the innovations being contemplated for using virtual simulation to restructure clinical hours and methods of education have profound implications for raising the bar for clinical competencies across the health professions in Colorado and nationwide. Therefore, the effort to make this happen – channeling expertise and diverse program and geographic inputs, mobilizing the resources required, understanding and advocating for the benefits to be accrued from virtual simulation – requires a collaborative approach that the proposed Center could provide.

Study informants expressed positive support for the concept of a Center, and reported being neutral about Regis playing the role as host or sponsor. Stakeholder discussion affirmed several points that were also raised during one-on-one interviews with administrators and faculty about factors that would be important for soliciting formal commitments for their participation:

- Governance. Organizing a Center requires a “democratic” approach, grounded in community conversation and principles of participation formalized e.g. via by laws. Serious consideration needs to be given to the representation and participation processes that will ensure credibility, buy-in, effective decision-making and accountability for progress toward defined goals and objectives.
- Statewide versus Denver-centric. Steps must be taken to ensure that the Center is organized to accommodate the full gamut of rural and urban needs, programs and institutions. Based on their experiences, rural programs are skeptical about Denver centric programs.
- Potential organizational models. A point of dedicated leadership to advance virtual simulation is needed, but is the right concept one Center or linking to available resources and relationships? One way or another, other entities and institutions actively involved in simulation such as CAPE, Wells Center and the Center for Nursing Excellence need to be taken into account as the model for a Center is developed. Serious consideration needs to be given to factors leading to the failure of past collaborative efforts when structuring the formal requirements and benefits of participating in the Center.
- Focus on realistic incentives for participation. Planning must take into account the pervasive institutional fatigue factor at play across Colorado’s health professions institutions due to profound state funding constraints combined with severe programmatic strains with the ramp up in the last decade to produce more graduates. Faculty and student buy in will be critical factors for successfully advancing virtual simulation.

The Value Proposition for Virtual Simulation and the Center

During one-on-one interviews, administrators were candid about being interested in the concept of a center but cautious based on past collaborative failures and what would be expected in terms of faculty contributions. While not ready at this point to commit to sharing faculty time or offering their institution's endorsement of a Center, they emphasized that they are interested to further define the mutual benefits of the Center and the business model that would define "the skin in the game." They agreed that dedicated leadership and resources are needed to achieve the proposed innovations in clinical education.

Study informants pointed to a set of critical priorities for the work of a Center that would be of great value to participants.

- Understanding trends, planning for change. The work to redefine clinical education must consider the evolving landscape of health care delivery systems, clinical models of care, and professional roles and relationships. Formulating plans for a Center and virtual simulation need to be forward thinking and strategic in the timing and prioritization of efforts, helping participants to understand and plan for change. Any changes to pre-licensure clinical education need to consider the parallel movement of the clinical practice environment toward primary care roles, residencies and hospital magnet status, in order to target expectations and design approaches for pre-licensure clinical preparation accordingly.
- Developing and fostering a model for restructuring clinical education. A critical piece of work will be to develop consensus for a framework of clinical education objectives, then develop a blueprint for how to match them to technology and particular types of simulation resources and how to link the use of simulation to on-site clinical experiences.
- Providing leadership and venue for academic-clinical collaboration and policy leadership. Clinical institutions are playing lead roles in restructuring health care delivery models and need to be involved in developing a blueprint for desired clinical competencies and educational objectives. Policy leadership is important to support broad acceptance and support for changes among regulators, policy makers and the public at large, drawing upon the Center's efforts to foster a consensus framework for health professions educational changes.
- Shared tools and resources. Individual schools would benefit from collaborating to develop games and a repository of resources that can be shared, and adapted as necessary.
- Faculty development. Administrators emphasized that academic leaders nationwide are grappling with the need to mobilize faculty to make the requisite educational changes for enhancing competencies. For example, Colorado is participating in the Robert Wood Johnson Quality and Safety Education Project Phase III and engaged in conversations with nursing faculty in several states. These difficult discussions reveal the levels of faculty support that will be necessary to enable them to retool and implement changes in educational approaches, including virtual simulation. Study informants identified faculty development as a top priority for a Center and as part of any attempt to develop virtual simulation as part of clinical education. Early experiences implementing the use of other forms of simulation as part of health care education have shown

that, despite expressed interests in potential innovations, faculty don't themselves take on leadership roles to change their teaching methods. Study informants made similar observations: faculty are "fried" i.e. fatigued from heavy workloads; many are not comfortable with technology; to date, efforts to use simulation as part of a school's clinical curriculum have required special accommodations and/or additional dedicated resources. Across the various educational programs it has taken a person with special interest and energy to develop and advocate for simulation related activities.

Stakeholders commented on a range of specific issues that must be addressed to overcome barriers to expanding the use of virtual simulation as part of clinical education and to solicit formal and productive engagement with a Center's activities.

- Business model. Administrators emphasized that soliciting formal engagement of academic institutions will require leading with a business model; it will be essential for them to understand the "give and get" – the range of potential costs and return on investments to consider making formal commitments from their academic institutions for the release of faculty to participate in Center activities, and to make other investments of technology, curriculum changes etc.
- Attribution and intellectual property. The business model must grapple with issues critical to knowledge based organizations and traditional avenues for faculty performance and advancement. Administrators emphasized that these issues must be addressed explicitly as part of the business model, and will be key to engaging faculty and institutions in making formal commitments to the Center.
- Technology capacity. Rural informants emphasized that consideration must be given to the realistic limitations of current technology capacity particularly in rural areas with limited broadband access.
- Financial costs and benefits. Administrators and faculty noted that academic institutions will weigh the costs and potential benefits from supporting changes in clinical education. Relevant factors offered by Study informants include:
 - *technology:* hardware and software, programming, network support, technical training and expertise and if and how technology supports would be allocated across programs
 - *administration:* scheduling, human resources, student logistics
 - *human and physical capital:* personnel requirements, implications for physical space and learning environments
 - *students:* potential benefits from expanded computer-based access to self-paced learning, enhanced testing and remediation; possible reduction or addition of costs/fees.
 - *faculty:* impact of computer-assisted teaching methods, time and costs for training, potential benefits from revised faculty-student ratios and reduced/streamlined faculty clinical preceptor work load. Potentially schools might hire fewer clinical instructors but need to understand the extent of release time from current teaching load that faculty would require to participate as experts to the Center and developing virtual simulation scenarios.
- Faculty/student perceptions. A potential barrier to engagement from institutions and faculty is the current lack of a robust evidence base for the impacts of virtual simulation and games on educational experience and outcomes within the health professions. Many faculty tend to teach the way that they were taught and many faculty and stu-

dents have strong attachment to direct clinical experience as the desirable venue for clinical education. On the other hand, informants perceive that many students are comfortable with computer-assisted environments and learning venues. Informants predict that opportunities to practice to mastery and have exposure to safe clinical practice before they see patients would be viewed very positively by students, mitigating the stress that students relate when placed directly into clinical situations with patients.

- Opportunities for research and evaluation. The Center would offer the ability to structure valuable opportunities for faculty advancement through program evaluation and other research and publications related to educational innovation and virtual simulation. Administrators emphasized that this would be viewed as a very desirable benefit from Center participation.
- Demonstrating higher levels of clinical competencies. Academic programs and clinical institutions would each see a range of potential benefits from participation in the Center's efforts to produce more clinically competent entry level practitioners. Key to this would be setting targets, and planning for measurement and evaluation, taking into account the implications of evolving clinical practice settings such as magnet hospital requirements, and primary care settings.

OBSERVATIONS AND CONCLUSIONS

The results of this Phase I study indicate that there is definite support among Colorado stakeholders for using virtual simulation and serious games as part of nursing, pharmacy and physical therapy clinical education.

The preliminary framework for using virtual simulation as a clinical tool, as developed by the Study Advisory Committee (see Appendix), was discussed by Colorado academic administrators and faculty. In their view, the framework articulates the many advantages of virtual simulation and game-based scenarios for addressing current gaps in clinical education and competencies. Study contributors were very clear that urgent priorities for improving health professions education can be addressed by integrating virtual games, other forms of virtual simulation and new clinical teaching methods as part of clinical experiences for pre-licensure students. Supporting access to virtual clinical experience would be particularly valuable for rural schools and students; it would help to fostering alliances between the community college system and ADN and BSN programs as Colorado pursues the IOM goal to achieve a target of 80% of Colorado nurse prepared at the bachelor level.

Most significantly, virtual clinical education is viewed as essential to support safer and efficient mastery of clinical competencies necessary in today's evolving health care environment, including inter-professional team based roles. Through the virtual computer-assisted learning environment, expectations for demonstrating competencies can be defined and measured; performance against benchmarks can be assessed; student practice opportunities can be increased and customized; opportunities for remediation can be provided; and preparedness for clinical practice can be enhanced.

It appears that a solid foundation is established for moving forward to develop virtual simulation as a component of clinical education. There is a baseline of experience and widespread acceptance of human, low and high fidelity simulation among Colorado’s various health professions academic institutions, along with the desire to share best practices and strengthen how these current resources are being used. Additionally, as evidenced by their engagement and enthusiasm during the Study, Colorado has a cadre of knowledgeable and enthusiastic “early adopters” among Colorado faculty who are eager to begin immediately to pursue the benefits of virtual simulation. As plans to develop gaming scenarios are put into place, stakeholders see that efforts can begin immediately with available virtual simulation resources to develop a workable model for how virtual simulation can be used in pre-licensure preparation. There is definite interest in working collaboratively, moving beyond silos of activity, to leverage the time, resources and faculty expertise from programs across the state. In fact, despite difficulties sustaining past collaborations, Study participants emphasized that it is vital that they collaborate to realize new ways of educating health professionals.

Despite the levels of enthusiasm expressed by Study participants, significant issues warrant further investigation during the next phase of the Study. Determining a viable path forward for a Center requires understanding the cost model for clinical education in the context of the evolving health care and health care education systems. Achieving institutional and faculty buy-in and collaborative investments by academic and clinical institutions requires defining what such a “partnership” will mean – the skin in the game for participants – to formally engage and sustain a viable Center business model.

Colorado educators, and delivery system partners, have an invaluable opportunity to pursue important innovations in health care education that will benefit all Coloradans. Based on the Phase I Study findings and the level of input and interest demonstrated during the stakeholder meeting, Phase II efforts are warranted. Stakeholder engagement should be expanded, and steps taken to pursue further analysis and design of a Center and next steps for its development.

APPENDIX

| | |
|--|-----------|
| Interviewees | 15 |
| Stakeholder Meeting Participants | 16 |
| Stakeholder Webinar – Link | 17 |
| Stakeholder Meeting Agenda | 18 |
| Framework for Virtual Simulation and Clinical Education | 20 |
| Center Model | 24 |

Interviewees

| Name | Title | Institution/Organization |
|---|---|--|
| National Experts | | |
| Beth Mancini | Chair – College of Nursing | University of Texas--Arlington |
| Marjorie Zielke | Associate Director for the Institute for Interactive Arts and Engineering | University of Texas--Dallas |
| Diane Skiba | Health Care Informatics and Project Director | University of Colorado-Denver |
| Colorado Center for Nursing Excellence | | |
| Karren Kowalski | President & CEO | Colorado Center for Nursing Excellence |
| Jana Faragher | Director, Western Slope | Colorado Center for Nursing Excellence |
| Brian Kelly | Director of Development and Research | Colorado Center for Nursing Excellence |
| Administrators | | |
| Kristi Reuss | Professor of Nursing | Colorado Mesa State University/ Colorado Council on Nursing Education |
| Amy Barton | Associate Dean for Clinical and Community Affairs | University of Colorado-Denver |
| Nancy Smith | | University of Colorado-Colorado Springs |
| Deborah Kenny | Associate Dean For Research | University of Colorado-Colorado Springs |
| Carol Weber | School of Nursing Dean | Regis University |
| Faculty /Simulation Coordinators | | |
| Sandy Summers | Professor of Nursing | Lamar Community College |
| Shawn Anderson | Simulation Laboratory Coordinator | Metropolitan State University of Denver |
| Jody Panian | Clinical Coordinator and Assistant Professor | Colorado Christian University |
| Allison Bennet | Simulation Laboratory Coordinator | Adams State University |

| | | |
|------------------------|---------------------|--|
| Joann Crownover | Assistant Professor | Colorado State University--Pueblo |
| Mike Pascoe | Senior Instructor | University of Colorado-Anschutz Medical Campus |

Stakeholder Meeting Participants

| Name and Title | Professional Affiliation | Contact Information |
|--|---|--|
| Allison Bennett Nursing Simulation Laboratory Coordinator | Adams State University | allisonbennett@adams.edu |
| Amanda Jojola Nursing Program Director | Adams State University | ajojola@adams.edu |
| Carol Weber School of Nursing Dean | Regis University | cweber@regis.edu |
| Deb Center Project Director | Colorado Center for Nursing Excellence | deb@coloradonursingcenter.org |
| Fara Bowler Senior Instructor and Clinical Educa- tion Center Coordinator | University of Colorado, Denver | Fara.Bowler@ucdenver.edu |
| Flossie O'Leary Director, Foundation and Corporate Relations | Regis University | foleary@regis.edu |
| Hollie Caldwell Associate Dean of Nursing | Platt College | hollie.caldwell@plattcolorado.edu |
| Janet Houser Academic Dean, Rueckert-Hartman College for Health Professions | Regis University | jhouser@regis.edu |
| Jeffrey Getchell Director Learning Technology | Regis University | jgetchell001@regis.edu |
| JoAnn Crownover Assistant Professor | Colorado State University, Pueblo | joann.crownover@colostate-pueblo.edu |
| Jody Panian Clinical Coordinator and Assistant Professor | Colorado Christian University | jpanian@ccu.edu |
| Kari Franson Associate Dean for Professional Educa- tion | University of Colorado, Denver | Kari.Franson@UCDenver.edu |
| Katie Myers Assistant Director of Clinical Educa- | University of Colorado, Denver | |

| | | |
|--|---|--|
| tion, Department of Physical Therapy | | katherine.myers@ucdenver.edu |
| Lori Cook Instructor of Nursing | Regis University | lcook@regis.edu |
| Lynn Dierker Consultant | Health Management Associates | Ldierker@healthmanagement.com |
| Marcia Gilbert DNP Coordinator, School of Nursing | Regis University | mgilbert@regis.edu |
| Marianne McCollum Assistant Dean for Assessment School of Pharmacy | Regis University | mmccollu@regis.edu |
| Megan Schumacher Experiential Education Coordinator School of Pharmacy | Regis University | mschumacher002@regis.edu |
| Mike Pascoe Senior Instructor | University of Colorado, Denver | mike.pascoe@ucdenver.edu |
| Rebecca Moote Assistant Professor, School of Pharmacy | Regis University | rmoot@regis.edu |
| Sandy Summers Director of Nursing | Lamar Community College | sandy.summers@lamarcc.edu |
| Shawn Anderson Simulation Lab Coordinator | Metropolitan State University of Denver | sande110@msudenver.edu |
| Susan Davis Instructor | University of Colorado, Colorado Springs | sdavis4@uccs.edu |
| Susan Scherer Associate Dean, Rueckert-Hartman College for Health Professions | Regis University | sscherer@regis.edu |

Stakeholder Webinar - Link

Virtual Simulation: The Potential for Clinical Learning” January 22, 2013

<https://hlthmgt.webex.com/hlthmgt/ldr.php?AT=pb&SP=MC&rID=15539372&rKey=ea0241cb563f7f1c>

Stakeholder Meeting Agenda



Virtual Simulation in Nursing, Physical Therapy and Pharmacy Education: Considering an Approach to Strengthen and Expand Clinical Experience

STAKEHOLDER MEETING

January 31, 2013 10:00 am – 2:30 pm

Regis University

3333 Regis Blvd, Denver, CO 80221

Clarke Hall, Room 139

MEETING OBJECTIVES

- *Foster shared understanding about what constitutes virtual simulation and its value as part of health professions education and in particular, clinical education*
- *Understand needs and priorities across Colorado educational institutions for using virtual simulation to augment clinical placements as part of Colorado nursing, physical therapy and pharmacy curricula*
- *Understand the kinds of supports that would benefit schools and how schools view the value-proposition of a Colorado Center*
- *Assess the preliminary level of interest by the schools to participate in a collaborative initiative led by Regis to develop a Colorado Center*

AGENDA

- 10:00 AM **GETTING STARTED**
- Welcome and introductions
 - Meeting objectives and agenda
Susan Scherer, Associate Dean, Rueckert-Hartman College, Regis University
Lynn Dierker, RN, Health Management Associates
- 10:15 AM **THE CASE FOR VIRTUAL SIMULATION TO TRANSFORM CLINICAL EDUCATION IN COLORADO**
- Urgent broad and local imperatives for change
 - Momentum for simulation and health care education
 - The potential of technology and virtual gaming for clinical education
Lynn Dierker
Susan Scherer
Jeff Getchell, Director of Technology, Rueckert-Hartman College, Regis University
- 10:45 AM **AN APPROACH TO INNOVATION: DEVELOPING SIMULATION RESOURCES FOR COLORADO**
- A multi-faceted feasibility study, sponsored by The Colorado Health Foundation
- Regis faculty self-assessment, rationale and prioritization for simulation
 - Preliminary conceptual model for a collaborative approach via “Center”

- Assessing stakeholder interest and support for further development

Susan Scherer

11:15 AM **BREAK**

11:30 AM **WORKING LUNCH – CONSIDERING COLORADO’S READINESS AND INTEREST**

Key themes from conversations with national leaders, Colorado faculty and program directors about current clinical education, uses of simulation and views about expanding simulation for clinical education

Lynn Dierker

12:00 PM **YOUR INPUT - WORKING COLLABORATIVELY TO PURSUE PRIORITIES FOR GAME-BASED SIMULATION**

Discussion Session I

Participants will discuss a series of issues and questions related to changing how clinical education occurs in Colorado to incorporate more virtual simulation, including game-based simulations. Discussion will seek to elicit participant input regarding:

- *Current gaps in clinical education and the potential for virtual simulation and game-based education to improve the acquisition of clinical competencies.*
- *Thoughts about how virtual simulation including gaming could be integrated into clinical hours, including where and how virtual simulation would relate to components of current clinical rotations*
- *Content areas that should be considered as priorities for development*

1:00 PM **Break**

1:15 PM **Discussion Session II**

Participants will next discuss a series of issues and questions related to time, effort, costs, potential barriers and perceived value from collaboratively developing the proposed simulation resources. Discussion will target issues including:

- *What barriers prevent more effective and expanded use of simulation*
- *Supports for faculty and students that will be necessary for schools to successfully integrate new teaching and learning approaches as part of program curricula.*
- *Technology issues for schools to support expanded computer-based learning*
- *Issues for rural versus urban schools*
- *How would schools evaluate costs and measure the return on investment from integrating virtual simulation including gaming as part of clinical education?*

2:00 PM **MOVING FORWARD: CONSIDERING A COLORADO CENTER FOR VIRTUAL HEALTHCARE EDUCATION**

In addition to reviewing key take-aways from the afternoon’s discussion, information will be provided about the next phase of the feasibility study. Assuming that the study moves forward to evaluate options for establishing a collaborative effort, participants will be asked for initial reactions to a proposed conceptual model for a Colorado center. Input will be solicited regarding interest, information needs and recommendations for stakeholder engagement.

Susan Scherer

Framework for Virtual Simulation and Clinical Education

A Framework for Using Virtual Simulation as part of Undergraduate Nursing, Pharmacy and Physical Therapy Clinical Education

Preliminary Considerations

Regis Feasibility Study Advisory Committee

January 31, 2013

WHY EXPLORE INNOVATIONS IN CLINICAL EDUCATION?

- Regis faculty, like other academic leaders across the country, have come to recognize that the traditional model for providing students with clinical experience during undergraduate programs must be improved. Despite recent innovations such as the use of Clinical Scholars, it remains a challenge to ensure adequate clinical placements and experiences for all students across all areas of curriculum. Most importantly, the traditional approaches to providing didactic and clinical learning leave gaps in the acquisition of competencies that students require in clinical practice.

WHAT ARE THE CRITICAL CLINICAL COMPETENCY GAPS THAT NEED TO BE ADDRESSED?

- The learning objectives and priorities for the acquisition of competencies in clinical settings (i.e. what's intended to take place on a clinical rotation) differ from the acquisition of knowledge and skills in other learning settings.

| |
|--|
| <p>Knowledge (via classroom, in person or online)</p> <ul style="list-style-type: none"> • Physiology • Pharmacology • Nursing Theory |
| <p>Skills via Labs (i.e. task trainer, low fidelity or other)</p> <ul style="list-style-type: none"> • Repeated practice of technical skills • Examples: IV placement, manual therapy, drug compounding |



Competencies in Clinical Practice (i.e. clinical rotations, high fidelity simulation):

- Assess—identify abnormal/normal
 - Act on abnormal
 - Act on next thing – branching algorithm
 - Prioritize decisions
 - Communicate and interact with others (who do I call? when do I call? What are roles and expectations of various members of the inter-professional care team?)
-
- Multiple patients
 - Multiple conditions (include mental health)
 - Realistic patient scenarios (non- textbook)

- Current approaches to clinical experience via clinical placements/rotations offer students little opportunity to practice and demonstrate the integration of didactic learning into integrated clinical decision-making and actions as part of a clinical care team.

IS THE USE OF SIMULATION ADDRESSING THESE GAPS IN CLINICAL EXPERIENCES?

- Simulation offers the ability for students to practice and learn in a safe environment without risk of harm to others. It is widely accepted as part of education and training outside health care for demonstrating practice competencies.
- As part of health care education, simulation is being acknowledged as valuable and necessary by the professions, academia and clinical providers. The use of simulation labs and centers is becoming widespread in health care education with a focus on human simulation, low and high fidelity simulation (i.e. with mannequins).
- Regis like many other academic programs is using its simulation resources as part of the percentage of clinical hours allowed for this purpose by the Colorado Board of Nursing and other professional regulators. The use of this type of simulation is impacted by available faculty and student hours, space and physical resources.

WHAT DO VIRTUAL SIMULATION AND GAME-BASED SCENARIOS (AKA SERIOUS GAMES) OFFER FOR IMPROVING CLINICAL EDUCATION?

- Virtual simulation can be used to enhance content delivery, acquisition of clinical skills, development of team-based competencies, evaluation with remediation, and testing.
- There are various types of computer-assisted simulation resources available and being developed that can provide students with expanded and enhanced opportunities to learn and practice dimensions of clinical skills and competencies.
- Virtual game-based simulations are computer-based games with an educational focus and specific game objectives that can be synchronous or asynchronous, single or multi-player.
- Game content can incorporate scenarios that are:
 - Procedure based
 - Case based (emergent /urgent) focus on the ABC (airway, breathing, circulation)
 - Setting based (inpatient, outpatient, rehab)
- Educational games are tailored to the educational objectives and environments of users, requiring the input of faculty in the health care professions, in conjunction with individuals with gaming expertise.

WHAT ARE THE DISTINCT ADVANTAGES OF USING VIRTUAL GAME BASED SIMULATIONS OVER OTHER FORMS OF SIMULATION FOR PORTIONS OF CLINICAL EXPERIENCE IN PRE-LICENSURE PROGRAMS?

- Measuring individual performance to meet learning objectives.
 - Each student has to participate (no group grading)
 - Data can be collected about student performance in the game
- Providing frequent feedback to students on performance which is not-faculty time dependent
- Expanding and strengthening acquisition of competencies

- Routine clinical practice elements can be reinforced in various settings (e.g. when I see cyanosis, I apply O2)
- Standardized virtual experiences can target key dimensions of clinical practice that are not consistently available on clinical rotations (e.g. COR)
- Technology can incorporate patient expressions, colors or sounds beyond the psychomotor dimensions available through use of high fidelity mannequins.
- Technology allows student to respond to situations of variable and increasing complexity (respond to the next decision, and the next decision).
- Scenarios can be designed to deal with multiple patients or patients with multiple conditions.

HOW ARE LEARNING OBJECTIVES ADDRESSED WHEN INCORPORATING VIRTUAL GAMES AS PART OF CLINICAL HOURS IN PRE-LICENSURE PREPARATION OF NURSES, PHYSICAL THERAPISTS AND PHARMACISTS?

- A potential clinical experience model using virtual simulation would re-define learning objectives across three different settings for clinical learning.

| | | |
|--|--|--|
| <p>Virtual 10% Skills /decisions that should become rote ID sounds or observation Interaction with others Complex safety Interprofessional communication and roles</p> | <p>Mechanical 15% Psychomotor skills Interaction with others Complex safety IPE communication & roles</p> | <p>Direct Clinical Experience 75% Live patient interactions Live staff interactions Real environmental context</p> |
|--|--|--|

- Consideration must be given to how the use of virtual simulation is considered for both didactic and clinical hours.
- Consideration must be given regarding whether a Mastery Learning approach will be instituted as part of using virtual simulations (i.e. set competency and allow multiple attempts until competency is achieved)
- Using computer based simulations requires interactions by faculty
 - Clinical oversight needs to be included when games are implemented in practice.
 - Clinical oversight is built into the game (clinical instructor shows up when student makes a poor safety decision)
 - Clinical oversight in the form of debriefing occurs after the student completes the game.
- Use of virtual games should provide data to assess students’ clinical decision making
 - Data should be collected from individual players of the games. This includes:
 - Time to each decision
 - Number of correct decisions
 - How decisions are related to clinical outcomes (For example, “number of minutes to tissue necrosis” measures if the student exceeds the recommended

time frame for assessment and action before the limb becomes necrotic and requires surgery)

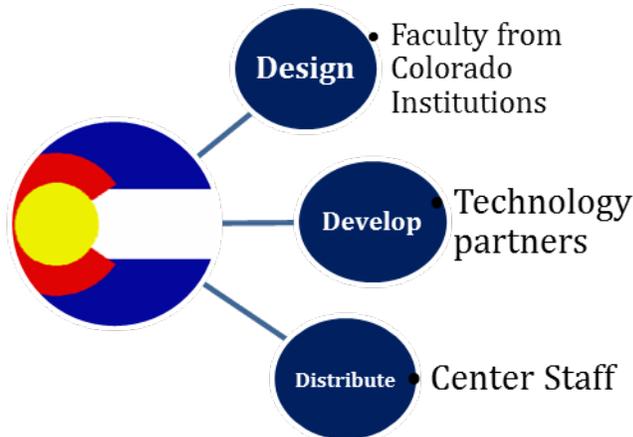
- Game should include aspects in which students can progressively demonstrate independence.
 - Level 1: Help is available for decisions via help screens or virtual interaction by a clinical instructor
 - Higher levels: No help is available

WHAT ARE PRIORITIES FOR DEVELOPING CONTENT AND USING VIRTUAL SIMULATION AND GAMES VIA A COLORADO “CENTER”?

- Focused in hospital settings (greatest clinical need)
- Developed for content which is both high and low volume on clinical rotations and safety related (emergent or urgent conditions)
- Be focused on developing student ability to respond to multiple decisions (what happens next) that are based on their previous action
- Include management of multiple patients which replicates real-world practice
- Develop patient scenarios which represent real-world complexity
- Include interaction with other members of the health care team
- Include elements of clinical practice such as progressive independence
- Collect data to assist students in developing competency and assist clinical instructors in facilitating learning
- Integrated with clinical oversight guidelines appropriate for each institution

Center Model

COLORADO CENTER FOR VIRTUAL SIMULATION IN HEALTH CARE EDUCATION



DESIGN

- New simulations may be designed with faculty from the partners contributing content expertise in collaboration with instructional designers and technology (gaming) experts.
- Individual institutions determine how simulations will be used in clinical and what kind of oversight is needed.

DEVELOP

- Center keeps an inventory of available virtual products that will address the clinical needs of the institutions involved
- Products are revised or developed as needed to address institutional needs

DISTRIBUTE

- Center organizational structure created to allow for sharing virtual simulations among Colorado collaborators
- Develop a business model for generating revenue to cover design and development costs

COLORADO CENTER FOR VIRTUAL SIMULATION IN HEALTH CARE EDUCATION

The mission of the Center is to promote collaboration among health care educational institutions in Colorado to address clinical education needs through the development and use of virtual gaming simulations.

WHO MAY PARTICIPATE?

Faculty, instructional designers and administrators from schools of nursing, physical therapy and pharmacy in the state of Colorado may join the center. Members of the center are expected to contribute content knowledge towards the development of virtual products (faculty or instructional designers) or assist in assessing outcomes of center activities (administrators). The Center will be based at Regis University.

WORKS CITED/ REFERENCED

- Center for Medical Simulation*. (2009). Retrieved December 2012, from Harvard Center for Medical Simulation Website: http://www.harvardmedsim.org/?_sm_au=iVV4n6WSvVMJ3Dqs
- INASCL. (2011). Retrieved December 2012, from International Nursing Association for Simulation in Clinical Learning Website: http://ssih.org/about-ssh?_sm_au=iVV4n6WSvVMJ3Dqs
- Simulation Innovation Resource Center*. (2011). Retrieved December 2012, from Simulation Innovation Resource Center Website: <http://sirc.nln.org/>
- About SSH: Society for Simulation in Healthcare*. (2012). Retrieved December 2012, from Society for Simulation in Healthcare: http://ssih.org/about-ssh?_sm_au=iVV4n6WSvVMJ3Dqs
- WELLS Center. (2012). Retrieved December 2012, from WELLS Center Website: <http://www.wellssimulationcenter.org/>
- CASE Service: University of Colorado School of Medicine*. (2013). Retrieved December 2012, from University of Colorado School of Medicine Website: <http://www.ucdenver.edu/academics/colleges/medicalschoo/education/cape/Clients/Pages/CAPEServices.aspx>
- Clinical Simulation Program* . (2013). Retrieved December 2012, from University of Wisconsin School of Medicine and Public Health Website.
- Cheney, A., & Sanders, R. L. (2011). Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches. *Information Science Reference* , 248-270.
- Games, A. I. (2011). Virtual Worlds: An Environment for Cultural Sensitivity in Education in the Health Sciences. *Int.K. Web Based Communities*, 189-205.
- Duke University: Human Simulation and Patient Safety Center*. Retrieved December 2012, from Duke University Website: <http://simcenter.duke.edu>
- International Society for Technology in Education. (n.d.). *ISTE and NETS*. Retrieved January 2013, from ISTE.nets: <http://www.iste.org/standards>
- Kellerman, A. L., & Jones, S. S. (2013). What Will It Take to Achieve the As-of-Yet Unfulfilled Promises of Health Information Technology. *Health Affairs* , 63-68.
- NTSAToday (2010). *I/ITSEC 2010, Serious Games, CliniSpace*
<http://www.youtube.com/watch?v=3RX6znCQ-Q4>
- Richards, S. (2008). Health Games, Simulations, and Technology: Wave of the Future for Learning . *Indiana Epidemiology Newsletter*, 1-2.
- Sanford, P. G. (2010). Simulation in Nursing Education: A Review of the Research. *The Qualitative Report*, 1006-1011.
- Silverspar, S. (2009). *Accelerated Nursing Program in Second Life from UW-Oshkosh College*
<http://www.youtube.com/watch?v=oReztKUpGI>
- Skiba, D. J. (2008). Games for Health . *Nursing Education Perspectives*, 230-232.
- Skiba, D. J. (2008). Nursing Education 2.0: Games as Pedagogical Platforms. *Nursing Education Perspectives*, 174-175.
- Skiba, D. J. (2009). Nursing Education 2.0: A Second Look at Second Life . *Nursing Education Perspectives*, 129-131.

- Skiba, D. J. (2012). Technology and Gerontology. *Nursing Education Perspectives*, 207-209.
- Zielke, M., Evans, M. J., Dufour, F., Christopher, T. V., Donahue, J., Johnson, P., et al. (2009). Serious Games for Immersive Cultural Training: Creating a Living World. . *IEEE Computer Graphics and Applications* , 49-60 .
- Zielke, M., LeFlore, J., Broderick, V., & Ziegler, R. (n.d.). "A model for creating simulated medical equipment in a situational gameplay context: The virtual Ventilator".
- Zielke, M., LeFlore, J., Dufour, F., & Hardee, G. (2010). Game-based Virtual Patients--Educational Opportunities and Design Challenges. *Interservice/Industry Training, Simulation, and Education Conference* .
- Zielke, M., Roome, T. C., & Krueger, A. B. (2009). A Composite Adult Learning Model for Virtual World Residents with Disabilities: A Case Study of the Virtual Ability Second Life Island . *Journal of Virtual Worlds Research* , 3-21.