Virtual Interactive Practice™: Utilising Healthcare Information Systems to Contextualise the Skills associated with Clinical Decision making within Nurse Education

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Abstract

This paper reports on a Virtual Interactive Practice™ (VIP) project that has the potential to revolutionise the educational delivery and learning of clinical skills complementing real' practice. The focus is currently on nurse learning but the principles could equally be applied to multi and inter-professional learning and clinical decision-making. This project represents a new model to enhance clinical skill acquisition and clinical reasoning using a structured competency base. Integral to this is a strong partnership between education and practice utilising 'real' live and recorded anonymised patient data from a critical care clinical information system (CIS) within a large district general hospital to structure scenarios fostering problem-based learning. This educational practice interface enables the synthesis of clinical data using virtual technology and sophisticated scenario-based simulation within a skills laboratory. The aim is to enhance the more ad hoc system of learning within conventional practice placements. Early findings suggest that VIP™ enhances practice providing a safe but challenging learning experience with the benefit of instant performance feedback to students.

Keywords:

Skills acquisition, clinical information systems, nurse education, virtual interactive practice, simulation.

The problem of skill acquisition

The projected shortfall of the required numbers of health professionals especially in English speaking nations, particularly amongst nurses [1,2], is being addressed in the UK mainly by a huge increase in recruitment. Today, as a direct result of staff re-organisation [3], downsizing, changing workforce, service reconfigurations and the shift towards the hospital at home, students have fewer opportunities to practice and hone their clinical/practical skills [4].

The rise in demand for clinical skills

In England, the University of Southampton has approximately 1,200 students enroll each year on pre-registration health programmes principally in nursing, medicine and allied therapies.

The School of Nursing and Midwifery has expanded its pre-registration education programmes by approximately 300% over the past 5 years with an annual intake of 800 students. On qualifying all students should be 'fit for practice' to meet the statutory requirements to register as a practitioner (UK Nursing and Midwifery Council). Today's student nurses are required to be on a continuous life long learning trajectory [5, 6] which moves towards a self directed journey examining the patient and client in the context of the care delivery setting. Clinical reasoning and the understanding of outcome management assist in moving the student practitioner on towards mastery of learning [7]. However, the shortage of qualified staff, the degree of clinical activity and the high volume of students competing for clinical experience often thwart the quality of learning in the real world of practice [8].

Research into professional education and skill acquisition in communities of practice [9] found that nurses and midwives largely embodied 'performance-based learning in clinical settings'. Furthermore, it is evident that this knowledge skills base is intimately related with professional identity. Skills acquisition and assessment should therefore demand the same rigour as applied to academic learning, but for some of the reasons already highlighted this is not always achievable due to lack of parity of experience within practice.

The establishment of virtual reality in learning clinical nursing skills

The rapidly changing health care environment, adult learning theory and emphasis on accountability has helped enable education and practice providers to move away from didactic instruction [10] to a more interactive problem based learning environment. The utilisation of virtual reality (VR) is becoming established in nurse education [11,12] with a steady growth in the use of virtual reality in health care education and training generally over the past decade [13].

The terminology surrounding VR can however be deceptive. For example, it has been used to describe a computer-based training module [14], which is a collection of video clips and animation, as an alternative to a lecture. At the other end of the

spectrum, VR describes a computer programme, which simulates catheterisation of the lateral ventricle of the brain [15]. Other authors refer to computer based simulation or VR when they actually mean a mannequin or other apparatus driven by a computer to generate scenarios [16-20] for medical training.

The Concept of VIP™

For the purposes of VIP™ with pre-registration students we have defined VR as: A real learning experience from an interaction, that has no steer or effect(s) on patients' or client outcomes, being separated from the event by time and or distance.

Scenario-based simulation is developing as a forceful tool for professional health care skills training. However, these experiences in our opinion and other authors are often perceived as stilted and lacking dynamism [21,22]. To engage students even more fully, we have produced a virtual interactive practice environment that takes real live and recorded data from a clinical information system directly into the skills laboratory/classroom. The use of real time as well as the ability to modify time with recorded data, we believe adds an additional dimension of realism and pressure for students to 'perform well'. For example a patient who is admitted and who becomes hypoxic due to inhalation pneumonia may rapidly deteriorate 'forcing' the student to make appropriate clinical decisions to prevent further deterioration mediate by applying the appropriate therapeutic regimen. If this is not followed the computer driven patient simulator (CDPS) can be programmed to have a life-threatening event, which then enables the students to explore consequences of action or inaction under time constraints that emulate real practice.

The material for inclusion within the scenarios is acquired from practice areas (issues relating to consent are addressed with individual patients, parents, staff members and the Caldicott guardians from the Trust). The integration of digital images (still and video), sounds (breath/heart sounds), and anonymised clinical data in standard clinical format, enables real patient scenarios to be synthesised. These scenarios are developed to meet specific practice learning outcomes from the various nursing curricula, and are therefore grounded in sound educational principles and required student competences.

The student's assessment of practice (AOP) document is the key tool used to identify and formulate the content for each of the scenarios (essentially this document outlines the learning objectives for each of the students for individual clinical placements). Approximately 30 key objectives are required to be achieved within the AOP document and these can be themed into core learning outcomes; an example is given below:

- Communication and interpersonal skills
- Ethics and professional development
- Fundamentals of nursing practice
- Health education and health promotion skills
- Management and decision making skills.

The practice objectives within each core-learning outcome are then mapped to 'active' experiences, which are incorporated within the scenarios. Table 1 provides an example of this 'mapping' process, the learning outcome related to health education and health promotional skills is utilised within this example.

Table 1: Mapping process for learning outcome

Core Learning Outcome - Health Education and Health Promotion Skills	
Practice Objectives	*Examplar of 'Active' Experience*
• Identifying the health concerns of individuals • Providing relevant health education advice • Teachning individuals or groups • Understanding national and local statutes and policies which influence health education and promotion in health care	Researching clinical practice in pursuit of «best practice» Devising patient education tool i.e. patient directed care of a Hickman line Devise an asthma care pathway for the toddler admitted with an acute exacerbation Develop internet and presentational skills

The scenarios used within the VIP™ module contain elements from each of the AOP key objectives. Reference groups are established with educationalists and practitioners to ensure that the content of each scenario is evidence based and credible in relation to the patient experience. The scenarios depict differing elements of the patient journey, clinical emergencies, management issues and research. For example, the deliberate emphasis on research based practice helps to steer the students to explore differing resource sites on the Internet e.g. National Electronic Library for Health and www.nelh.nhs.uk) Isabel (www.isabel.org.uk) and consider there application within day to day clinical practice.

Scenarios can also be devised to lead the student through a 'story', which may span a few days and with the 'staged' introduction of differing elements can really test the student's ability to see the patient and their family in a holistic way. In essence VIP™ can mirror any clinical situation over a 24 hr period and depending upon the context of the clinical decision making skills to be experienced by the students the trajectory can be in real time or condensed to enrich the learning opportunity.

Recently the University has made a significant investment in terms of equipping the School of Nursing and Midwifery with high specification clinical skills laboratories with the capability of directly linking through to practice areas. This enables the students to engage clinicians, specialist practitioners and other healthcare professionals at the point of care. This facilitates case history presentations and the observation of clinical practice. There is the additional capability of being able to utilise video conferencing to engage international and nationally acclaimed clinical and educational experts in decision making from the scenarios that the students have experienced

Within the clinical skills laboratories the students access the scenarios using lap top computers, the scenarios are devised on web based software and they interact with the scenario's in differing ways so that they can be formally assessed in relation to their de-

cision making skills. Thus student decisions can then be compared to those made in practice and or programmed into the computer driven patient simulators (CDPS) for the students to respond. Student's are equipped with radio microphones and video-recorded to enable the teaching staff to gain insight into theirverbalised thoughts, psychomotor skills and to evaluate their performance on an individual and/or group basis. This has proven especially useful to see team working when a scenario requires an acute and rapid response such as an anaphylactic reaction. Students have also found the facilitated critical appraisal of their performance both as individuals and as a member of a team to be beneficial. They can, as neophytes, learn safely from their mistakes and feel positive about examples of safe practice. The learning environment, student behaviour and reflective practice focusing on clinical reasoning are three key constructs utilised to enhance practice learning within VIP™. In addition VIP™ allows the opportunity for students to explore their own personal feelings in relation to professional identity, self-esteem and confidence at the end of each scenario/module..
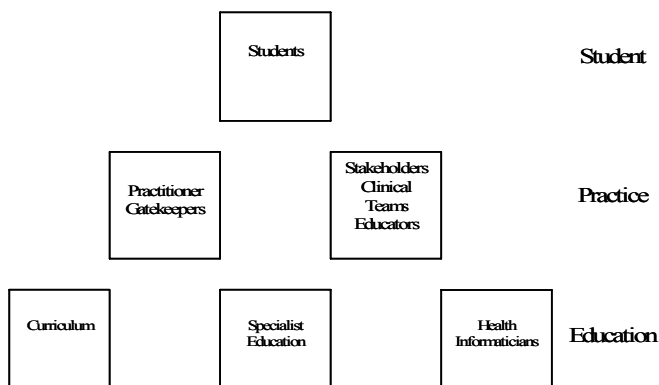

Figure 1 - Conceptual model to develop virtual interactive practice

Discussion merging technology, simulation education and practice

The interface between health care professionals and technology within high performance health care organisations whether higher education institutions (HEI's) or health care providers, requires competent and reflective practitioners [7]. Nurse education has expanded its focus in relation to critical thinking and clinical reasoning models [23] incorporating reflective practice [24]. However, the need to ensure the contextualisation around skill acquisition within the nursing skills laboratory has eluded educators [25]. Preparing individuals for this role naturally requires students to interact with both personally and professionally challenging scenarios delivered through an entirely technological platform. It is imperative that these scenarios reflect 'real' practice to ensure a veritable experience.

At the University of Southampton we have developed strong synergistic partnerships with clinical placement providers, particularly Portsmouth NHS Hospitals Trust. This Trust has recently developed and implemented a fully integrated 'state of the art' CIS within its Department of Critical Care, this represents one of the first formal steps for the Trust as it moves toward the

electronic patient record. The automated solution within the department includes direct bedside links to the ventilators and bedside monitoring system and to other key clinical departments such as radiology whereby images can be reviewed at the bedside utilising the picture archiving communication system (PACS) and pathology. The CIS is utilised by all members of the multidisciplinary team to record patient observations, interventions and treatments (this includes digital images). Decision support and care protocols have also been incorporated within the system to enhance the care at the bedside. A departmental intranet also provides point of care access to educational material and policies and procedures. Developments within the department also include the use of live video streaming to interact with other healthcare professionals for educational purposes. In addition, telemedicine has been utilised to guide and support the care of some critically ill patients who are too unstable to be transferred to specialist centres.

The wealth of clinical data stored within the CIS provides an excellent data bank from which contextual data can be extrapolated and constructed into patient focused scenarios. There is also the additional functionality of being able to video stream interventions 'live' into the classroom. The media and clinical data is then formulated into scenarios and/or used to develop the computer driven patient simulation material. Whilst standardised patients (SP's) and computer driven patient simulators (CDPS) have distinct benefits of assuming physiological characteristics and the flexibility to make scenarios very real. However there are also widely recognised drawbacks notably in relation to the lack of certain humanistic qualities[26]. Nevertheless this can be partially overcome by incorporating and integrating clinical data from the 'real' patient holistic perspective. The ability to then synthesise and integrate this into in the learning environment is the ethos of VIP™ and thereby sets it apart from virtual reality and conventional delivery of nurse education.

Conclusion

This paper has outlined a number of significant problems in acquiring effective clinical skills for student nurses. These problems are largely due to student capacity within clinical areas which are already challenged by staff shortages and unrelenting clinical demand. In conjunction with the required impetus to provide more places for students there has been an apparent need to look for innovative new ways for students to learn 'hands on' nursing skills. The establishment of virtual learning as a platform for the delivery of nursing skills, combining clinical information systems and simulation is considered to be pivotal to the ethos surrounding VIP™ development. Through the utilisation of VIP™ we have demonstrated a deeply transforming means of mirroring real practice and in so doing augmenting the learning of practice-based competencies.

Some of the greatest challenges ahead lie in identifying and balancing the amount of educational input to enable students to be safe and accountable for their actions through VIP™. Engagement in VIP™ can allow students to reflect upon their own practice as well as that of their peers. For some it has necessitated a re-evaluation of their clinical abilities whilst for others it has sharpened their critical edge in skills performance. One of the

most exciting facets of VIP is the symbiotic integration of practice and education in an effective and efficient partnership, ultimately to ensure the delivery of high quality skilled nursing care.

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