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## Abbreviations

CDU	Charles Darwin University
RFDS	Royal Flying Doctor Service
vHospital™	Charles Darwin University Virtual Hospital™

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## 2.1 Introduction

The American Academy of Ambulatory Care Nursing defines telenursing as “the delivery, management, and coordination of care and services provided via telecommunications technology within the domain of nursing.”<sup>1</sup> This ranges from telephone triage, digital imaging for wound management, to electronic discharge planning. Telenursing is not a new field in Australia. In 1912, the Australian Inland Mission established nursing posts where nurses in outback Australia were stationed in remote towns and communities to provide care to the community. This care covered midwifery and the immediate emergency care needs of people suffering from injuries and acute illnesses, and the public health functions of health assessment, immunization, monitoring, and health promotion. By 1929 the Traeger pedal radio was introduced in North Queensland to allow communication between the nursing post and the newly established Royal Flying Doctor Service (RFDS) physician, thereby establishing the first routine telenursing service (Fig. 2.1). Within the first year, the RFDS had made 50 flights and treated 225 people. By 1934 a radio was installed in the aircraft allowing communication to be maintained with the ground. This heralded the first telenursing consultation with the physician in flight from a nurse at the remote town of Innaminka.<sup>8</sup> Today telenursing is widespread. Nursing triage call centers are available in every state and territory in Australia, and nurses routinely communicate with distant specialists using a range of technologies and web-based interfaces such as Wounds West (<http://www.health.wa.gov.au/woundswest/home>).

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**Fig. 2.1** The Australian \$20 note has the face of Rev. John Flynn and the pedal radio to his *left*

As nursing educators and academics endeavor to ensure that the teaching and learning environment keeps pace with the clinical environment, there is a need to ensure that students are engaged with current and emerging telenursing technologies as undergraduates. The Charles Darwin University (CDU) Virtual Hospital™ also known as the vHospital™ has been developed to ensure that students are presented with a rich online learning environment that encompasses a range of telenursing activities. This chapter presents an overview of the vHospital, highlighting the way that students experience telenursing through a range of interactive case studies.

## 2.2 Background

Using case histories is a routine teaching practice in undergraduate health science courses. Case-based learning, problem-based learning, and enquiry-based learning are all methodologies that use cases as their primary learning objects. Some of the cases are based on real patient data and some are developed by the academics to illustrate a range of principles. What cases have in common is that they are chosen for their relevance to the teaching context and the learning objectives of the course of study. The vHospital cases are developed by academics and industry partners to highlight the learning outcomes. They use actual patient data that are brought together with fictional elements to follow patients on their journey from their home environment into the hospital and then on to discharge.

The cases in the vHospital are currently used by CDU in a case-based learning mode. Case-based learning was chosen as the teaching methodology as it facilitates development

of professional knowledge and behaviors expected of the beginning practitioner; it enables students to see skills in context rather than a checklist of procedures that must be mastered.<sup>2</sup> The case-based learning environment reinforces the underlying patient-centered philosophy of the Bachelor of Nursing program. It highlights the fundamental principles that nursing care is concerned with the psychosocial, psychological, and physical well-being of the patient contextualized by their place within their family, community, and society. Case-based learning also allows students to work on their own rather than in small groups as is done in both problem-based learning and enquiry-based learning,<sup>3,7</sup> which is particularly pertinent to students studying in external mode. Australia, as a continent, has many different time zones and students studying externally choose this mode as it allows them to study “anytime/anywhere.” The cohort of CDU’s nursing students consists of approximately 20% internal and 80% external, many of whom are mature-age students living in rural and remote areas who do not have access to other students during the term time. Many of the students study part time to enable them to continue to work to support families. Case-based learning supports flexibility for students.

Nursing is a practice-based profession; however, the key elements that underpin all nursing practice are “problem solving, decision making, and clinical judgment.”<sup>10</sup> Undergraduate nurses need to be able to practice these problem-solving skills. Most teaching simulations are designed to do just that. However, it is difficult to provide a way of ensuring that the consequences of decisions are able to be felt by the student in more than the most rudimentary way, even with high fidelity simulation dummies and well-designed scenarios. The vHospital has taken a range of standard case studies that were used in the medical/surgical nursing and mental health nursing undergraduate units and designed them to be able to be delivered in an online interactive case-based learning environment.

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## 2.3

### Learning Telewound Care

Telewound care is a growing area of telenursing. The key principles of wound management are taught to all nursing undergraduate students. It is clear that as the variety of wound care products increases it is important to teach principles rather than just practices. Wound management has become a specialized field of nursing; however, there is a need to ensure that specialist care is available for people with complex and chronic wounds. A recent study in the USA reported that less than 0.2% of nurses were wound care certified.<sup>11</sup> The opportunity to seek specialist advice for wound care is enhanced by telehealth technologies, and students becoming familiar with the requirements and the skills will ensure that they are able to refer patients appropriately.

#### 2.3.1

##### The Patient Journey Begins

Students learning wound care in a clinical environment or with a simulation exercise are very frequently first shown the wound and then the patient, or they meet the patient in the context of the clinical setting where wound care is expected to be provided. In the vHospital,

students are introduced to the patient in the context of his/her life and observe the situation that made the person seek health care.

### 2.3.2

#### The Case

John Wayne is 55 years old and leads a relatively sedentary lifestyle. John lives in a remote Aboriginal community with his wife and children, and his grandchildren. John is the primary income earner for the family. He works as an environmental program supervisor which is an office-based job.

During the weekends John likes to go hunting with his grandchildren, but nowadays he mostly drives the “Troupie” [the colloquial name for a four wheel drive passenger vehicle] to the waterhole and gets the fire ready while the young ones go out hunting. In the past few months John has been experiencing unusual thirst, dizziness, occasional blurred vision and an awkward feeling of numbness in his right foot. John presents at the remote area nursing post with a non-painful wound on his foot caused by him stepping on a stone. The wound is not healing. The nurse and the visiting doctor consult with John and advise him that he needs to go to town for further tests and to have his wound managed (*Source: CDU vHospital*).

The students are given a picture of John as a person having fun with his grandchildren as well as a picture of the wound on John’s foot.

Students also have links within the vHospital to gain more information. The links include cultural considerations, external resources relevant to the case, and a link to the university library where relevant research papers and texts are held in eReserve.

John is brought from his remote clinic by RFDS to the vHospital.

Providing care for John will involve students gaining an understanding of John’s psychosocial, psychological, and physical care needs. From the story they are required to identify the relevant forms that will be needed when they admit John. They should assemble a wound care chart, a blood glucose monitoring chart, a nursing history and assessment chart, a general observation chart, a fluid balance chart, and the integrated progress notes.

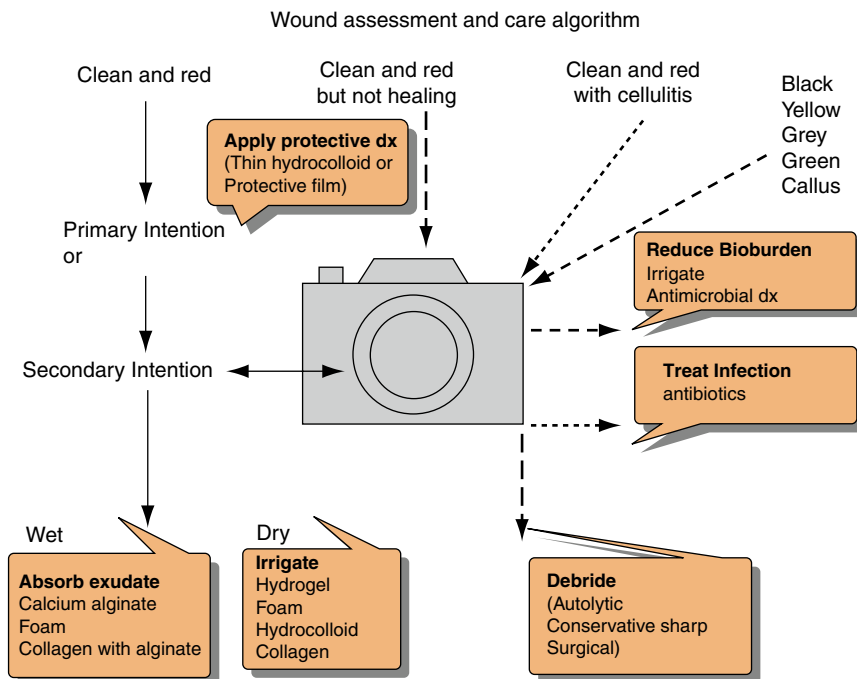
### 2.3.3

#### Providing Telewound Care

Once John is admitted to the ward, students consider John’s wound care needs. They are introduced to the tools of telewound care. They are presented with a digital image of John’s wound (Fig. 2.2) and a clinical algorithm or decision tree which includes when to take a digital image (Fig. 2.3).

The use of clinical algorithms based on best practice guidelines is a tool of telenursing, as it standardizes decision making and aids nurses on when and where to refer the patient or their information. In the case of telewound care, an image of the wound is indicated if the patient has a wound healing by secondary intention. This would include any burn wound, ulcer, trauma wound that was not sutured, or any surgical wound healing by

**Fig. 2.2** Wound image from the vHospital case John Wayne



**Fig. 2.3** Wound care algorithm from the vHospital case John Wayne

secondary intention. Treatment decisions are based on the algorithm and referral decisions are appropriate to a beginning practitioner, such as the presence of callus requires debridement – refer to wound care nurse consultant.

Once an image is recorded, there is a need to be able to standardize the measurement and assessment of the wound to determine the healing rate. There are a range of tools

readily available on the market for wound measurement, including software packages that calibrate and position the images and incorporate the clinical data into one record. It is not the intention to teach the students how to use each or any of these specific tools but to ensure that they can recognize the different types of tissues associated with wounds, such as slough, epithelizing tissue, necrotic tissue, and granular tissue, and can clearly draw around the wound edges and the edges of the various types of tissues. The surface area of the wound is measured and this information becomes part of the clinical notes.

Students have the opportunity to test their skills against an expert. They use an interactive pen tool to draw around the wound; they are then directed to click the link to compare their assessment against that of a wound care nurse consultant. Students are shown a series of clinical photos that indicate that John's wound has healed over time.

John is discharged back to his community before the wound has completely healed. A nursing discharge summary including a wound care electronic discharge summary is provided to the remote area nurse. The final chapter of the John Wayne case involves the remote area nurse requesting a consultation with the vHospital wound care nurse consultant. The image and the information provided show that John's wound has delayed healing and the consultant identifies that there is a buildup of callus on the wound margin; the final student activity requires the student to use the algorithm and provide the correct advice.

### 2.3.4

#### Handover

Between each of the chapters of the vHospital cases a handover is provided. This handover is a scripted, recorded handover between one health-care provider and the next, just as would happen at the change of shift or when handing a patient over for theater. The handover is an important communication tool between health-care providers. It is one of the most important patient safety measures in a hospital that takes up approximately 30 min/shift at least three times a day, 365 days/year<sup>9</sup> and is an area that students find difficult to master. In the case of John Wayne there are four handovers: on admission to the ward, between the Aboriginal health worker and the nurse, on discharge back to the community between the ward nurse and the remote area nurse, and a consultation between the remote area nurse and the vHospital wound care nurse consultant; two of these are a telenursing handover. Students need to listen to the handover and record the relevant information. They then use that information to complete the learning activities, such as filling in the clinical observations on the general observation chart or completing the patient history chart.

*Remote area nurse to vHospital wound care nurse consultant handover:*

**Eddie:** Hi is Isabelle there?

**Isabelle:** Speaking

**Eddie:** Hi Isabelle it Eddie Fielder here, the nurse looking after John Wayne in the community outside of Katherine.

**Isabelle:** Hi Eddie, I have received the photo you just sent via email. You are doing a fantastic job of healing John's wound.

**Eddie:** Thanks but the healing rate seems to be slowing now.

**Isabelle:** Have a look at the wound margin Eddie and tell me what you see?

**Eddie:** Well I can see that the wound is getting smaller but there appears to be some build up of callus.

**Isabelle:** Great Eddie. Yes the wound looks really healthy but you will need to debride that callus or the wound won't be able to heal completely. Remember for a wound to heal by secondary intention the epithelial cells need to form a bridge and migrate across the wound one cell at a time and they can't do this if there is callus or a build up of exudate.

**Eddie:** Thanks Isabelle. Will do. (*Source: CDU vHospital*).

### 2.3.5

#### Teaching and Learning Using the vHospital

There are currently six cases in the vHospital. Students access them via the online learning portal of the university, through their relevant subject link. The initial log on screen gives students a video and text introduction, and information on how to navigate their way around the vHospital and how to access additional information and resources. The top right-hand corner of the screen gives a floor plan of the vHospital; as they move their cursor over each of the areas there is a brief description of the clinical setting and the types of procedures that they will be able to see or practice in the area.

Each case is presented as a patient journey, with specific times or events presented as a chapter. In order to move on to the next chapter students are required to complete an activity that forms part of the formative assessment. The activity answers are stored in a database against each student login, and the lecturer is able to see the student's progress by accessing the database for their students.

The cases are designed to incorporate the learning outcomes of the beginning medical surgical nursing unit and the mental health nursing unit. Each of the cases is rich in video and audio learning objects. There are a large number of interactive activities from an interactive stethoscope for hearing breath sounds to interactive forms and interactive procedure setup trolleys. Procedural videos are provided for the nursing procedures and videos have been made to demonstrate the outcomes of the decisions that students make in some of the interactive activities, such as their response to an aggressive patient in the emergency department.

### 2.3.6

#### Other Cases in the vHospital

- Peter Abbott is an indigenous member of parliament who finds that he is unable to pass urine; during his hospital journey students prepare him for surgery and follow him through to operation and care for him post-operatively to discharge.
- Judy Thompson is an Australian international aid worker who has recently returned from Thailand and has developed flu-like symptoms. Students are required to triage Judy correctly to avoid starting an outbreak of H1N1 virus. They care for Judy as a medical patient with an acute respiratory illness.

- Beth Sheba crashes her car on the way to work and is brought in by ambulance to the vHospital. Students need to assemble to correct trauma team and care for Beth in the emergency department. She has a head injury and fractured arm. They then follow her through to the ward and provide her with pain management and fracture care.
- Bikey Bob is a tough tattooed biker who presents with chronic diarrhea and pain. Bob requires surgery for ulcerative colitis and students provide him with post-operative abdominal surgical care and stoma care and prepare him for discharge.
- Robert Bogan is a continuation of the Bikey Bob case. Bob is having trouble adjusting to his altered body image now that he has a stoma and develops a mental illness. Students have to manage his aggression in the emergency department so that he can be admitted; then they care for him with his suicide ideation and depression.

## 2.4

### Teaching Clinical Decision Making in the vHospital

Decision making in nursing is complex. Nurses learn to make nursing decisions based on their ability to gather data about a situation, interpret that data, and apply it to a clinical situation as nursing diagnoses and nursing intervention and then monitor the outcome of that decision. It has long been recognized that intelligent computer-based multimedia-simulated decision making can reduce the time to gain practical knowledge. This is readily recognized in pilot and driver training but has rarely been used in nurse training despite being recognized as a useful learning tool.<sup>4,5</sup>

The vHospital contextualizes student learning in real cases. It models good nursing practice and communication and allows students to see the consequences of their decisions played out. Research has reported that students benefit most when the formative feedback from their decision making is available immediately after the decision is made.<sup>5</sup> The vHospital is a safe environment for students to experiment with making a wrong decision. Each of the cases in the vHospital has at least one intelligent-simulated decision-making activity. Each of the clinical decisions has a try-again option, which provides feedback about the consequences of making a different decision. The decisions can be as simple as choosing from five options how long a patient should wait in the emergency department or choosing from three options when to call the doctor based on the patient's Glasgow coma score.

In the case of Judy Thompson, students are given the story that Judy has just returned from working on the Thai–Lao border as a volunteer aid worker in a small village. Judy relates the story of chickens dying in the village. She has returned to Australia and is staying with her sister and her new baby. Judy has developed flu-like symptoms and comes to the vHospital emergency department where she presents at the triage window and gives her video story. Students need to notice that there are a few elements of Judy's story that warrant careful consideration in how they manage Judy's triage category allocation. Knowledge of the triage categories is essential "know what" knowledge and implementing those categories with a patient encounter is "know how" knowledge.<sup>4</sup> The students' decision will impact on Judy's wait in the emergency department waiting area. After choosing a category, students watch a short video clip that resembles security camera footage of the

waiting room in fast forward; students see how many people sit next to Judy during her wait and have the potential of contracting Judy's illness. The final video clip is of a news report of Darwin being isolated by air as the result of an outbreak of pandemic flu which was thought to have started in the vHospital (Fig. 2.4).

Intelligent simulation systems are particularly useful in practice-based professions. They offer greater realism than paper-based exercises. Despite the cost of staging and producing the multimedia elements, they are less expensive than role play-based simulations, as the learning object, once created, can be used by many students simultaneously. And if well designed can be used over a number of years. According to Garrett and Callear,<sup>5</sup> intelligent simulations have a "distinct advantage over traditional multimedia systems as they offer the student individualised advice, promoting heuristic learning, rather than generalised didactic instructions" (p. 388).

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## 2.5 Evaluation

There have been several evaluations throughout the development and integration of the Bachelor of Nursing program. Initial evaluation focused on navigation, usability, content relevance, and interest. The participants found the content of the first case (Peter Abbott) engaging and easy to follow but had varied responses to completing the assessment tasks before being allowed to go on to the next chapter. Participants were particularly positive about being able to replay the procedural videos and found the quizzes self-explanatory and the type of feedback useful. The navigation and introduction were changed as a result of this early feedback. More recently, Hercelinskyj and McEwan<sup>6</sup> have reported that learning using the vHospital "helped students to place learning in a context that assisted them to understand the nursing role and responsibilities as well as how nurses work with others in providing patient care." Students reported being able to explore their role as student nurses, in a safe environment, prior to going on clinical placement. The complexities and realities of the nursing role and the importance of communication and teamwork were also areas that students commented on.

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## 2.6 Conclusion

The vHospital is an innovative computer-based learning tool that provides students with an anytime/anywhere media-rich learning environment. The vHospital is designed to be modified and built on over time as cases are built using a template format and then linked into the shell of the vHospital. Telenursing is incorporated as part of the role of the nurse within the vHospital and students are exposed to the tools and processes of telenursing.

Case-based learning is well suited to the development of intelligent simulation, as the cases are designed collaboratively between academics and clinicians to ensure that they

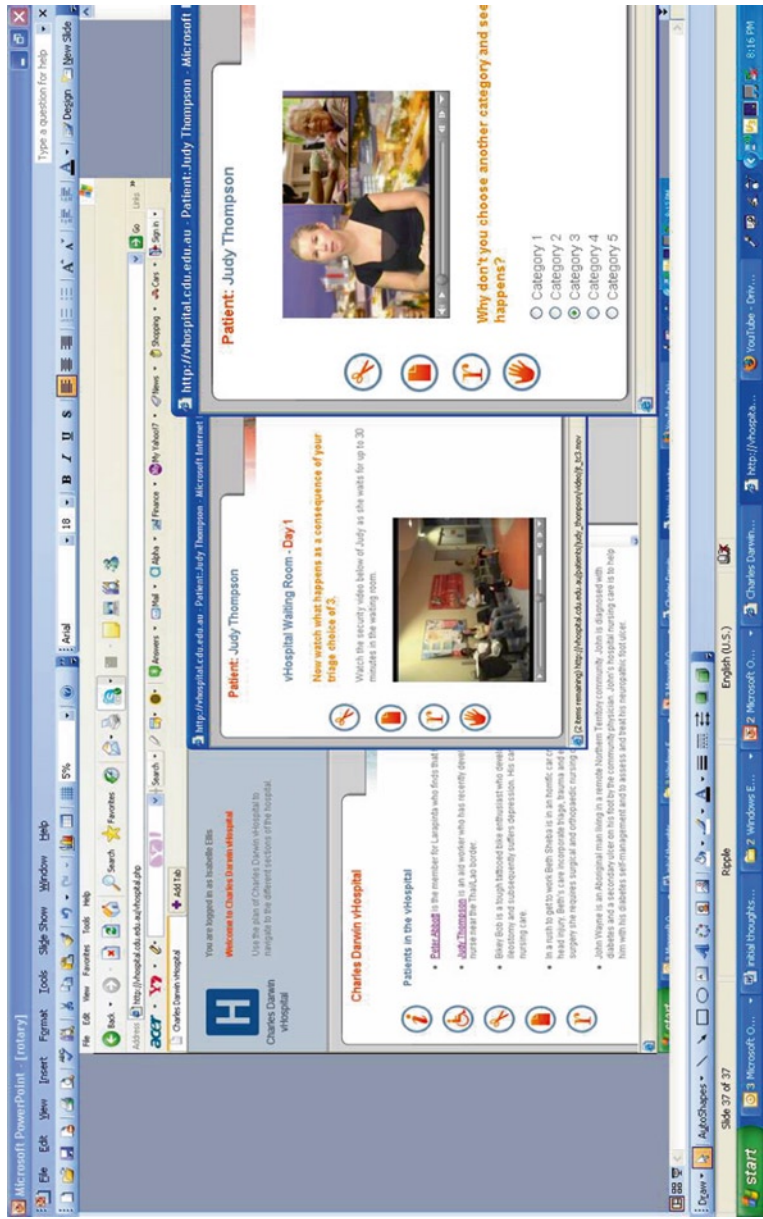


Fig. 2.4 Screen shots from the vHospital case Judy Thompson

are authentic and meet the learning outcomes of the course. Incorporating intelligent simulation activities into the cases acknowledges the complexities of the nursing decision-making process.

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## 2.7

### Summary

- Telenursing tools and processes need to be incorporated into nursing education.
- The vHospital™ is a media-rich online case-based learning environment.
- The vHospital™ uses case-based learning as it supports flexibility for students.
- The vHospital™ uses intelligent simulation to teach clinical decision making.

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### Glossary

Calibrate – To adjust or determine by comparison to a standard.

Case-based learning – Using case studies for learning.

Clinical algorithm – A decision tree to assist with clinical decision making.

Didactic instructions – The delivery of factual information to the student.

Digital imaging – Taking digital photographs.

Enquiry-based learning – A model of teaching that allocates students into groups to work on activities called enquiries.

eReserve – Electronic library holdings.

External mode – A mode of study where students do not meet face-to-face with the lecturer.

Formative assessment – A type of assessment that assesses incremental development of learning.

Heuristic learning – An educational method in which learning takes place through discoveries made through investigations made by the student.

High fidelity simulation dummy – A mannequin that is engineered or designed to model a person as closely as possible.

Interactive pen tool – A drawing tool that is controlled by a computer mouse.

Intelligent simulation – Simulation activities that respond to the student's decisions or choices and allow for alternate choices or decisions to be made.

Learning objects – Elements that are used in teaching; can be physical, audio, video, or a suite of activities.

Learning outcomes – The explicit outcomes that students are required to achieve from a course of study.

Log on screen – The initial Internet screen that the user puts their username and password into to allow access.

Online learning – The delivery of educational materials via the Internet.

Online learning portal – The opening page of an Internet website used for education.

Problem-based learning – A model of teaching that gives students problems to investigate and solve.

Simulation – A method of creating a learning environment or activity that models real life.

Telephone triage – Providing initial assessment of the patient by telephone.

Triage window – A window into the emergency department of a hospital that is manned by a nurse who makes the initial assessment of the patient.

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Telenursing

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2011, XIV, 202 p., Hardcover

ISBN: 978-0-85729-528-6