Virtual Reality Simulation in Nursing Education

ViReTrain
Virtual Reality Training for Healthcare Professionals

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Acronyms

Table of Acronyms

Acronym	Full Term
COPD	Chronic Obstructive Pulmonary Disease
DASH	Debriefing Assessment for Simulation in Healthcare
ED	Emergency Department
EU	European Union
EWS	Early Warning Score
INACSL	International Nursing Association for Clinical and Simulation Learning
IPC	Infection Prevention & Control
IT	Information Technology
IV	Intravenous
NMBI	Nursing and Midwifery Board of Ireland

OSCE	Objective Structured Clinical Examination
POC	Point of Care
PRN	Pro re nata
RN	Registered Nurse
SBA	Single Best Answer
TP	Teleporting
VE	Virtual Environment
VRS	Virtual Reality Simulation
VR	Virtual Reality
ViReTrain	Virtual Reality Simulation in Nursing Education

The terms "**learner**" and "**student nurse**" are used interchangeably in this handbook. Both terms refer to a nursing student in training at an university or college.

Foreward

Virtual reality (VR) in nursing education is an innovative teaching strategy that is receiving favorable responses from educators and learners alike. Like traditional (physical) simulation, VR simulation (VRS) has the ability to immerse the learner in an interactive virtual environment that mimics the real world of clinical practice, where the student nurse can make decisions in response to the nursing needs of a patient in an evolving scenario. With the rapid pace of change in nursing practice, changing patient demographics with associated increasing complexity of care, VRS offers faculty and nursing educators a new platform to deliver simulation, with greater flexibility and opportunities for repeated practice supporting competence development. In addition, there are lower costs and fewer resources required compared with physical simulation. Added to this there is emerging evidence that VRS is effective in supporting learner knowledge and skills acquisition, including clinical decision-making, critical thinking, communication skills and teamwork. Learners have also evaluated VRS positively, reporting high levels of satisfaction and engagement, and increased self-efficacy.

Facilitators and barriers to the implementation of VRS in health professions education curricula have been identified. These include technological issues, educational quality of VR scenarios, and training of educators in using and facilitating VRS. This handbook facilitates an easy introduction to VRS, supporting nurse educators in becoming familiar with the VR technology, trying out the VR scenarios and using them to deliver VRS in their classrooms. The VR scenarios provide experiential learning opportunities to nursing students which support development of nursing competencies for clinical practice. The aim of the handbook is to support nurse educators in the implementation of these modules and VRS, using the VR scenarios, into their nursing curricula.

Part one of the handbook outlines the pedagogic concept underpinning the modules and VR scenarios; this is contextualised within the complexity of nursing care and the frequently

contrasting perspectives of the nurse, patient and family, and the healthcare system and society. The VR scenarios are based on a nursing educational theory which places understanding of the individual caring situation, and problem-solving as the process of decision-making, at the center of scenario-based learning. In this context, the simulations are authentic, meaning they represent the reality of nursing practice. Furthermore, they permit professional judgements from different perspectives in the simulated care setting. The theoretical framework of these nursing-education scenarios can be viewed as a unique approach combining technical and non-technical skills in a VR simulation. The principles of the underlying educational theory are outlined in the handbook.

In addition, the hardware and software requirements are described in easy-to-understand language, introducing the educator to VR technology in nursing education. Instructional videos are embedded to support familiarisation with the technology in a user-friendly manner.

Part two presents the educational approach to the modules and provides step-by-step guidance on running of a VRS. The three modules are presented, namely, Post-surgery Nursing Care, Respiratory Nursing Care and Acute Stroke Nursing Care. The VR scenarios are explained in detail.

The nurse educator will find helpful references and web-resources throughout the handbook. Our website is an additional valuable resource.

We would like to acknowledge our partners in this ERAMSUS+ funded project, namely, colleagues in FH Muenster - University of Applied Sciences Germany, Turku University of Applied Sciences Finland, Via University College Denmark and Ingenious Knowledge GmbH Germany, who have contributed to this handbook. Additionally, we gratefully acknowledge the technical input and illustrations provided by Tim Kreuzberg, Rasmus Pechuel and colleagues at Ingenious Knowledge, GmbH, Germany.

Galway, 31st of August 2023

Yvonne Finn, Fionnuala Jordan, Nadin Dütthorn & Siobhán Smyth

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ViReTrain Project

In nursing there is rarely one solution to a problem. Nurses must be able to professionally justify the care strategies they choose, considering the evidence base knowledge, and the perspective of the patient and that of their relatives. Immersive technology such as virtual reality (VR) has seen an explosive advancement of application for nursing education. It is now practical to use VR to deliver simulation in a virtual clinical environment, creating experiential learning activities for nursing students. Virtual reality simulation (VRS) allows learners to engage and practice skills in a safe environment with continual backup and support that can be used alongside traditional simulation practices.

The modules and VR scenarios have been developed as part of the European Erasmus+ project, "*Virtual Reality Training for Healthcare Professionals*," (ViReTrain) which is funded by the European Union (EU). This project addresses educational needs for professional nurse education in a fast-changing world with increasing complexity of care.

The target group for this handbook is nurse educators.

The aim of this handbook is twofold: the first part of the handbook introduces nurse educators to the functionality of VR technology in a step-by-step and user-friendly way, even for those with little or no experience in VR technology. The second part introduces the module structure and explains in detail ‘how to’ run a VRS.

The handbook explains the theoretical background, and the educational concept and associated educational heuristic, which have guided the development of the VR scenarios. The three modules are outlined, and these include the VR scenarios, which present authentic patient cases. The handbook also offers material for reflection and debriefing in the VRS to facilitate nursing specific competencies with deep impact.

Nursing education is constantly being challenged to update clinical teaching and training in response to changes in nursing practices, reflecting changes in patient treatment, technological advancements, and patient demographics. More patients are presenting for care with multi-morbidity, reflecting an ageing population and the increasing prevalence of chronic diseases.

This transnational project addresses professional nursing education needs in an evolving world of technical advancements, patient multi-morbidity and increasing complexity of care. It focuses on a practice based, digitally simulated educational approach to developing authentic scenarios for training with VR devices.

This digital, scenario-based learning using fully immersive VR, is based on a German theoretical framework of nursing education, which focuses on simulated complex nursing scenarios (Darmann-Finck, 2010; Dütthorn, 2014). Training with VR can address psychomotor clinical skills such as checking vital signs, intravenous puncture, or tracheostomy care (Park, Hwang & Koo, 2023; Bayram & Caliskan, 2019). It is used to create simulations of nursing scenarios where the learner is asked to carry out a series of nursing tasks. With adequate preparation, learners should be appropriately aware of the realistic nature of content that mimics clinical practice.

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1.1 VRS in Nursing Education

Definition of VRS

VRS is defined as “Simulations that use a variety of immersive, highly visual, 3D characteristics to replicate real-life situations and/or health care procedures; virtual reality simulation is distinguished from computer-based simulation in that it generally incorporates physical or other interfaces such as a computer keyboard, a mouse, speech and voice recognition, motion sensors, or haptic devices” (Lioce et al. 2020, p.56).

Nursing Process and VR Scenarios

The nursing process is a theoretical model in nursing education that plays a key role in nurse's competence. This process is acknowledged as a theoretical problem-solving model (Fertelli, 2019) in nurse's clinical decision-making, leading to individualised nursing care (Alfaro-LeFevre, 2013; Ackley & Ladwig, 2014). It is divided into five essential steps: (1) data collection (which includes the identification of the relevant data and the diagnostic activities for

identifying the nursing diagnosis), (2) diagnosis, (3) planning (selection of nursing interventions), (4) implementation (application of nursing interventions) and (5) final evaluation (Doenges & Moorhouse, 2010).

The use of the nursing process has been shown to improve patient safety and nurses' legal protection and completeness of nursing documentation (Ammenwerth et al., 2001). The nursing process is integrated into the planning and development of the VR scenarios; this framework allows the learner to address patient problems in a logical and structured way.

The VR scenarios are authentic and complex, and present individual patient cases in the context of the social situational reality that newly qualified nurses encounter on a daily basis. Here we explain our understanding of complexity of care and competencies.

Our understanding of complexity of care in nursing education encompasses evidence-based nursing knowledge, contradictions and conflicting demands, including ethical dilemmas, and the perspectives of multiple stakeholders, reflecting practice-based nursing situations. In each of the VR modules learners can experience VR scenarios, which reflect this complexity of care, giving them opportunities to experience the real-world conditions, of delivering nursing care in the 21st century.

Each module addresses several competencies, which are relevant to the complexity of nursing care. Competencies are understood to be individual prerequisites (dispositions), which describe the ability and willingness of the learner to use knowledge and skills as well as personal, societal, and methodological abilities, and to behave in a professional manner to deliver safe person-centred care. It includes knowledge, skills, and attitudes. The design of the modules is based on these understandings of complexity of care and competencies. This has guided the authors in the development of competence-orientated educational VR scenarios.

COMPLEXITY OF CARE & COMPETENCIES | EDUCATIONAL HEURISTIC

The authors adapted an educational heuristic which acted as an instrument to guide the development of the modules and VR scenarios (Table 1). The educational heuristic is based on a nursing didactic model developed by a German nursing educational theorist, Darmann-Finck (Darmann-Finck, 2010). This instrument focuses on the nursing situation from multiple perspectives, including that of the patient, the patient's family, the nurse, other healthcare professionals, the health service and society. These perspectives relate to the educational processes of nursing students' acquisition of competencies and learning outcomes.

For example, nursing students' life experiences, their experiences from clinical practice and the educational environment can all play a role in the learner's learning processes. In our educational heuristic we identify three dimensions, namely the nurse (nursing student) perspective, the patient/family perspective, and the Institution/healthcare system perspective (Table 1). The perspectives of each are broken down into 3 categories:

- Technical knowledge
- Practical knowledge
- Emancipatory knowledge

	Perspectives		
Category	**Nurses**	**Patient/Family**	**Institutions/Health Care System**
Technical knowledge **Students know and explain…..** Scientific standards Evidence-based knowledge Guidelines Literature reviews	**Instrumental/Functional Knowledge** (Scientific standards, Evidence-based practice)		
Practice knowledge **Students realise /understand….** Experience-based practice Aspects of caring: emotional status, individual feelings, situative and contextual differences of a specific situation e.g. scenario Tacit knowledge	**Situative understanding through learning scenarios** (Caring, Emotional labour, Understanding individuals with feelings, emotion & personal motivation)		
Emancipatory knowledge / Reflection on contradiction **Students reflect…** Challenges, Conflicting demands	**Critical reflection on conflicts and contradictions** (Personal Professional, Societal)		

Table 1: Overview of Educational Heuristic

Technical Knowledge

This category can be acquired during the 'prebriefing' stage where students learn about relevant scientific guidelines, evidence-based nursing standards, and national and local policies and procedures that are relevant to the context, competencies, and learning outcomes in the modules.
Cognitive skills can be taught through didactic teaching, self-directed learning, case-based learning, and other teaching methods commonly employed in nursing education. The educational goal here is to raise awareness of scientific research as a basis informing "evidence-based practice" in nursing care.

Practical Knowledge

This category refers to the development of nursing competencies through the interactions of developmental processes, learning activities and experiences from simulations and clinical practice.
Hermeneutic processes of situational understanding of meaning come into focus. Since situations in the nursing profession cannot be dealt with exclusively according to standardised procedures, nursing students need to develop a hermeneutic competence to understand the patient's unique perspectives, including their emotions.
Practical knowledge is acquired as the student progresses through their nursing education, and can be addressed in VRS. Learners experience their own emotional responses and personal feelings towards the patient, and gain understanding of the patient's perspective and emotions within the context of their illness, clinical care, life circumstances and lived experiences.

Emancipatory Knowledge

The third category in the heuristic is based on a critical understanding of education focusing on self-development and critical reflection on societal as well as inner-psychological contradictions and clinical challenges.
We call this emancipatory knowledge/reflection on contradiction. To be able to cope with the ever-changing societal demands of health care systems and contradictions within daily nursing practice, including ethical dilemmas, competencies for critical-reflexive judgement formation are required (Darmann-Finck, 2010).
Professional nurses are called upon to reflect on the paradoxical and limiting social conditions in nursing activities, requiring emancipatory competence development. This knowledge enables nurses to make multiperspective interpretations and understandings of, and judgements about, individual patient situations. They are then able to make decisions based on an awareness of the

irrevocable contradictory demands of nursing care as a social practice in a dialectical movement of thought, applying critical reasoning and decision-making that best supports critical thinking (Darmann-Finck, 2006).
Through reflection, including self-reflection, and critical appraisal, which takes place in the 'debriefing' phase of VRS, emancipatory knowledge, as well as technical and practical knowledge, can be critically appraised, leading to deeper understanding, development of new meanings and consolidation of knowledge.

Didactics, a term in use by (continental) European educationalists, refers to the doctrine of the goals and content of teaching and frequently includes teaching methodologies. It is akin to the use of the term pedagogy by U.K (United Kingdom) and Irish educationalists. In broader definitions of the term, didactics is synonymous with teaching, i.e., the part of pedagogy that deals with the provision of knowledge. In this section we adapt this broader under understanding of the term didactics.

Each of the VR scenarios have been developed using a template on the educational heuristic (Table 2).

	Perspective of the nurse	Perspective of the patient	Perspective of reference persons (relatives/carers)	Health Care Systems' priorities and targets
Technical knowledge Students know and explain... Scientific standards, Evidence Based Knowledge, Guidelines, Literature reviews	Identify the nursing standards & guidelines Standardised operating procedures in provision of nursing care	Identify the standards and evidence-based guidelines in provision of patient-centred care e.g., symptoms and signs of illness and diseases	Explaining the instrumental problem-solving strategies regarding the reference person e.g., addressing the needs of immediate family member/s of a patient with dementia	Describe the standardised priorities, policies and regulations of the healthcare system
Practical knowledge Students realise/ understand... Experience based practice, Aspects of caring: emotional status, individual feelings, situative and contextual differences of a specific situation (scenario), tacit knowledge	Recognising and understanding on one's own interests, motives, feelings and values of the nurse in delivering patient care	Seeking to understand the patients' perspectives, motives and emotions	Seeking to understand the reference of persons' perspectives, motives and values in relation to the caring situation	Understanding the interests and motives of the health care system and/or society
Emancipatory knowledge Students reflect on.... Challenges, contradictions	Exposing socially shaped and inner contradictions of Nurses Consider contradictions and alterative solutions	Uncovering socially shaped inner contradictions of the patient's values and beliefs	Uncovering socially shaped inner contradictions of reference person	Exposing socially shape institutional contradictions, such as legal regulations conflicting with nurses' professional values and patients' perferences

Table 2: Educational Heuristic Template

Step 1

Scenarios for Virtual Reality Simulation with High Level of Immersion in Nursing Education: A Systematic Literature Review (Pernica et al., 2023).

This literature review identified nine different scenarios for VRS with high levels of immersion used in nurse education. The VR scenarios reviewed focused on complex nursing skills such as critical care, preoperative processes, urinary catheterisation, vacuum blood collection and neonatal infection control.

Learning outcomes tested and achieved were predominantly in the domains of psychomotor skills and cognition. Associated positive outcomes noted in the literature included the acquisition of knowledge, skills, confidence, critical thinking, and high levels of learner satisfaction.

Step 2

Methodological Approaches and Competence Areas of Nursing Students in Virtual Reality Simulation Research (Koskinen et al., 2023) - under review

The second review scoped theoretical frameworks, methodological approaches, and competence areas in nursing education research related to VRS with a high level of immersion. Our analysis revealed that existing research employs a wide variety of theoretical frameworks and research methodologies, exhibiting limitations similar to those found in prior studies. In addition, several studies did not utilize a learning theory or an instructional design framework as the foundation for their research. Our analysis delineated two categories of nursing interventions. The first category included basic nursing interventions requiring individual skills in non-acute nursing care, such as catheterization and blood collection. The second category involved complex interventions requiring team-based skills in acute situations such as acute schizophrenia care. The learning outcomes demonstrated promise in the competence areas of knowledge and skills. There was a discernible emphasis on training specific skills, with relatively less attention directed towards facilitating the attitudes and values of the participants. Therefore, further research is warranted to explore the potential of VRS in the acquisition of competence in the domains of attitudes and values of nursing students.

Step 3

Non-technical skills facilitated by Virtual Reality Simulation in Health Care Education - Scoping Review (Koskinen et al., 2023) - under review

The third review responded to limitations found in the second review and scoped non- technical skills (NTS) facilitated by VRS with a high level of immersion in nursing education. VRS exhibited promising results in enhancing NTS among nursing students.

However, these results demonstrated occasional contradictions, particularly in the context of communication skills. There was a scarcity of information in relation to personal resource-based NTS such as emotions, empathy, and ethics. As the realm of VRS in nursing education advances, this review underscores the continuous requirement for research to elevate nursing education and patient care by combining NTS training with contemporary technologies like VRS.

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1.2 VR Technology and Introduction to VRS

Introduction

VR is a digitally created environment that simulates the real world and can be experienced by the senses. The level of immersion ranges from semi to fully immersive systems, while interaction may be passive (simply observing) or active (ability to interact and manipulate the VE).

A level of immersion refers to how a user perceives and interacts with the VE through body movements. Immersion levels are largely device dependent and can be grouped into low, moderate, and high immersion. There is a positive correlation with the level of immersion and presence in the VE. Therefore, high levels of immersion can trigger higher levels of presence in the VR situation (Slater, 2018).

Levels of immersion and interaction is in turn influenced by the hardware and software systems used. The VR system used in ViReTrain is the *Valve Index VR kit.* For a full immersion experience, we recommend the system requirements specified by the manufacturer of Valve Index – see below.

This section describes essential information, requirements, and processes for nurse educators when using the Valve Index VR kit. This is depicted visually in the flow diagram below (Figure 1).

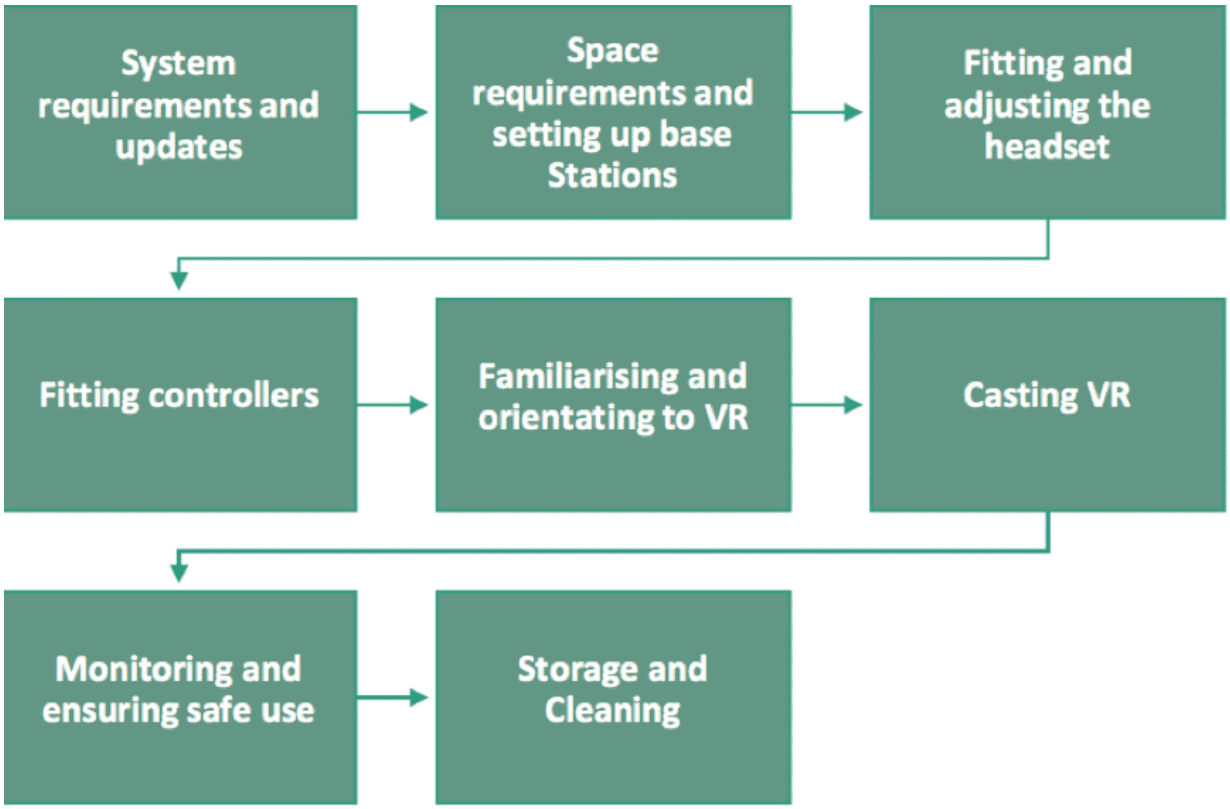

Figure 1: Flow Diagram Depicting a Step-by-Step Guide to using Valve Index VR kit to Deliver VRS

Using Valve Index VR kit

System Requirements

The manufacturer of Valve Index VR kit has detailed information on the specifications of the PC/laptop, connectors, ports, and Internet requirements. There is also an interactive discussion/chat function on the website to assist with any queries in relation to system requirements. We recommend that you seek guidance from the I.T. department of your institution, to assist in purchasing hardware and software that will give the best VR experience for you and your learners. You can access the website by clicking on this link.

Value Index VR Kit

You can access the website by clicking on this link.

VISIT SITE

PC or Laptop Software Specifications

At this time of publication of this handbook (August, 2023) our technical partner, Ingenious Knowledge GmbH, provides the following recommendation:

> "We recommend a computer with a dedicated graphic card. The Valve Index requires a Display Port connection. Please note that adaptors from HDMI to Display Port are not recommended, as these are not officially supported by the Manufacturer. The system requires Windows and at least the minimum specifications mentioned on the official shop page of the manufacturer. We have been testing on systems with the following specifications listed in Table 3"
>
> ViReTrain project, Ingenious Knowledge GmbH

I.T. specifications
Intel i7-3370 @ 3,4 GHz
16 GB DDR3 RAM
Nvidia GTX 1650
Windows 10

Table 3: IT Specifications

These specifications have been tested and used by the ViReTrain project team. For further updates/changes to specifications as they arise, please see manufacturer's website.

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Steam Support

Log in to your Steam account to get help with your Steam games, contact Steam Support, request refunds, and more. Help is also available if you can't log in, need to reset your password, or recover a hijacked account.

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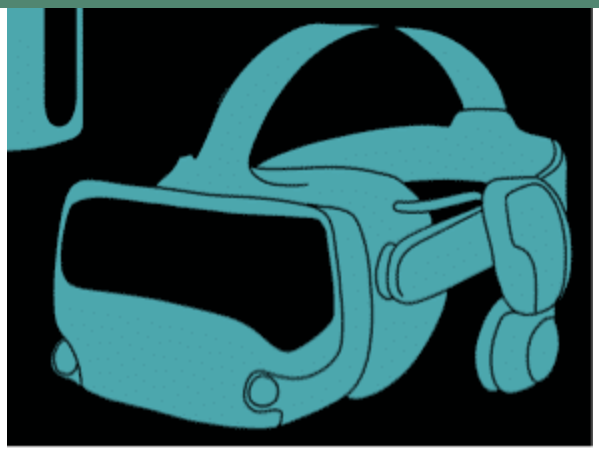
The Valve Index Headset



The Valve Index Headset consists of dual 1440x1600 RGB LCDs. The headset offers six degrees of freedom (6-DoF) which means that it allows the user to track if they are looking up, down, forward, backward, laterally, or vertically. This gives the user freedom to explore and inspect the VE and increases immersion. The Valve Index has a frame rate of 120Hz which results in greater realism and optical comfort for the user. This in turn may lead to longer viewing time and comfort.

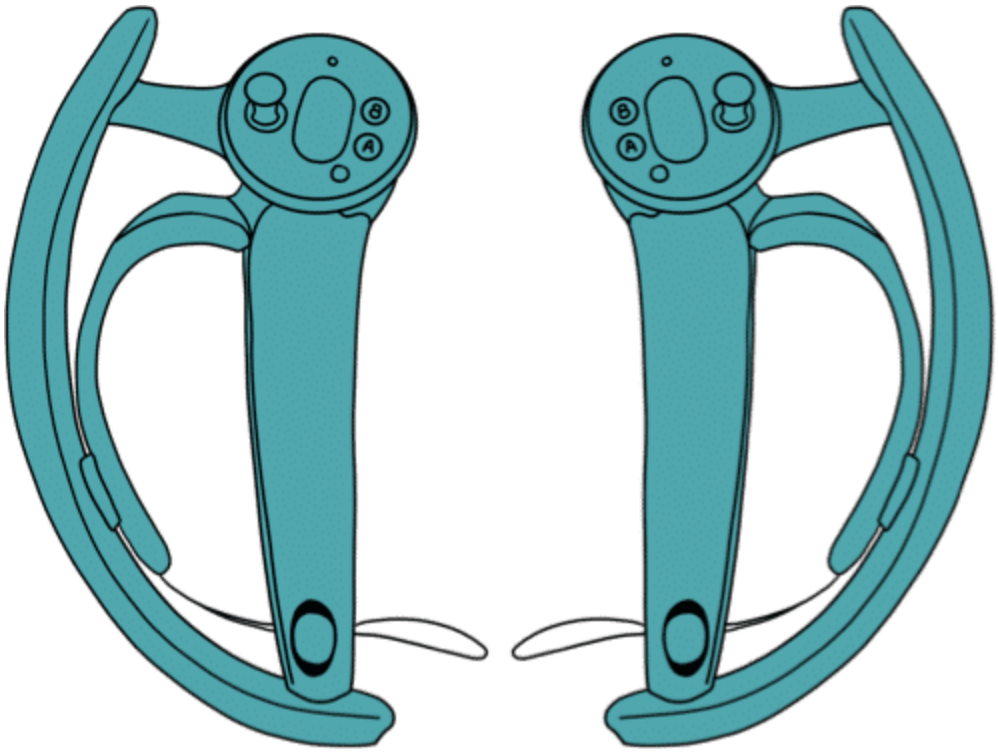
The Valve Index Headset has a built-in camera, which allows the VRS to be cast on screen(s) in 2-D. This enables the nurse educator and other learners to observe the VRS in real time.

FITTING AND ADJUSTING THE HEADSET

The valve index headset is wired and should be plugged into an electricity source when in use. There are three cords at the end of the headset wire: The Headset Display Port cord, the Headset USB cord, and the Headset power adaptor. We recommend following the guidance on the manufacturer's website Valve Index Setup Guide, which also has short videos demonstrating where to connect the Headset plugs.

To fit the Valve Index headset on the user's head please see the guidance and short videos on the manufacturer' website here. The headset can be adjusted to suit an individual's head size, face angles and ear position. Padding that makes contact with the skin has antimicrobial properties and evenly distributes pressure to contact areas of user's head and face. The magnetic interface allows for easy cleaning – please follow the manufacturer's guide. This padding is replaceable and can be ordered from the manufacturer.

Valve Index Hand Controllers



The Valve Index hand controllers enable users to interact in VE with objects and people, similar to the real world. Interactions are facilitated through sensors on the controllers which track hand and finger position, motion, and pressure. Two controllers, one left and one right, are designed to be held in the left and right hand respectively. Each controller has straps, which means the controller is worn rather than held. This means that the user can fully relax their hands at intervals if they wish to do so and the controller will not fall. The hand straps are anti-microbial and easy to clean. Each controller has a USB charging cable. During VRS the Valve Index controller cables should be disconnected.

Key functions of the hand controllers include:

- Grasp and release: It is possible to grasp and release objects using the controllers. In addition, it is possible to use the controllers as pointers with interfaces.

- The learner can move (virtually) in the VE. This can be achieved by teleporting (TP). The learner presses the thumb button on the hand controller and points at the ground. Pointing at the ground will project a green square on the VR ground. Releasing the button will teleport the learner.

We have included a tutorial on the key functions of the hand controllers in the ViReTrain project on our website. Nurse educators and learners can access this VR tutorial once the ViReTrain software set-up has been completed.

- The hand controllers must be charged with cables. They have integrated batteries. Please note, the battery life of fully charged Valve Index controllers is between 6-8 hours. We recommend keeping spare batteries in the storage areas.

THE VALVE INDEX BASE STATIONS

SPACE REQUIREMENTS

The Valve Index base station is an essential part of the VR equipment and is used to track the Valve Index headset. The base station should be placed on a solid surface that is not prone to vibration or movement. The base station should be pointed at the centre of the VRS space and should be in the line of vision of the user. Further details on where and how to position the base station see 'Index Base Station & Lighthouse tracking'.

It is also important to remember that depending on the height position of the base station, it may need to be angled vertically. For example, the base stations are positioned above head height, they will need to be angled, 30-45 degrees downwards, directed at the centre of the VR space.

The base stations can be wall mounted. For a step-by-step guide on mounting the Valve Index base station on a wall. Please see the guidance at Valve Index Setup Guide

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Steam Support :: Index Base Station & Lighthouse Tracking

UNDEFINED STEAMPOWERED >

THE VALVE INDEX BASE STATIONS

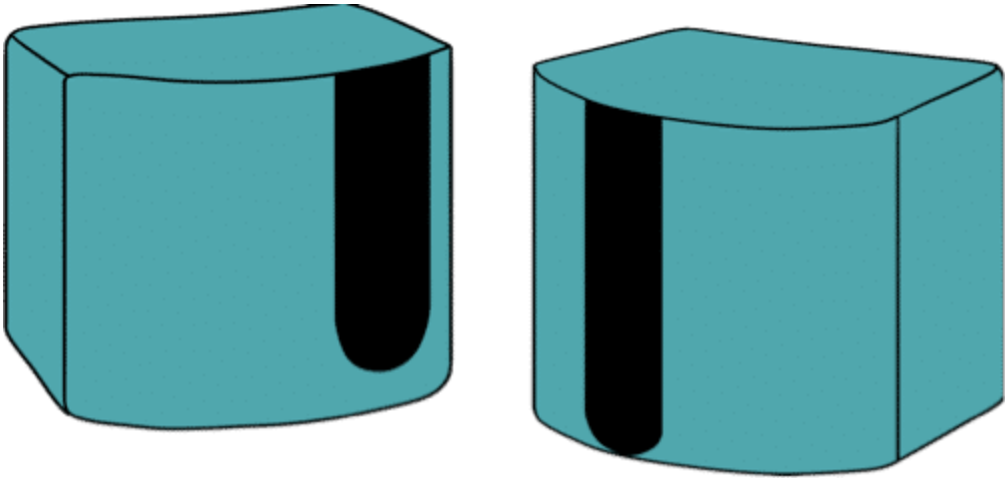
SPACE REQUIREMENTS

To be able to move within a room the Valve Index requires free space of at least 1.5m x 2m. Standing-only or seated setups require less space but are not officially recommended.

The Valve Index has internal security measures which give users a visual indication when they leave the free space that has been created during setup.

The space should have no windows, mirrors, stairs, or steps. It needs to be clear of all obstacles, including furniture. It should not be near a door or doorway. In terms of space for VRS, the learner should have enough room for their outstretched arms, including the controllers, such that they will not touch walls, ceiling, or objects around them.

When present, the nurse educator and other learners should be always outside of the VR space. For further details see Valve Index Setup Guide.



Wearing Glasses or Prescription with the Valve Index Headset

The Valve Index has ample room for prescription glasses and, like most headsets, has a dial to adjust the lenses so that the learner can see better. There are also special pads that can provide more room and some users prefer lens adaptors that fit right into the headsets.

Prescription lenses are not supplied by the manufacturer of the Valve Index VR kit, but other sources of lens are available. We do not recommend any particular prescription lens but advise anyone planning to acquire prescription lens should check they will fit the Valve index headset and do not significantly impact the range of vision of the user.

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Valve Index VR kit, available at https://uk.pcmag.com/vr-1/134467/valve-index-vr-kit

ViReTrain, available at ViReTrain website

The websites were last accessed August 2023

1.3 ViReTrain Software

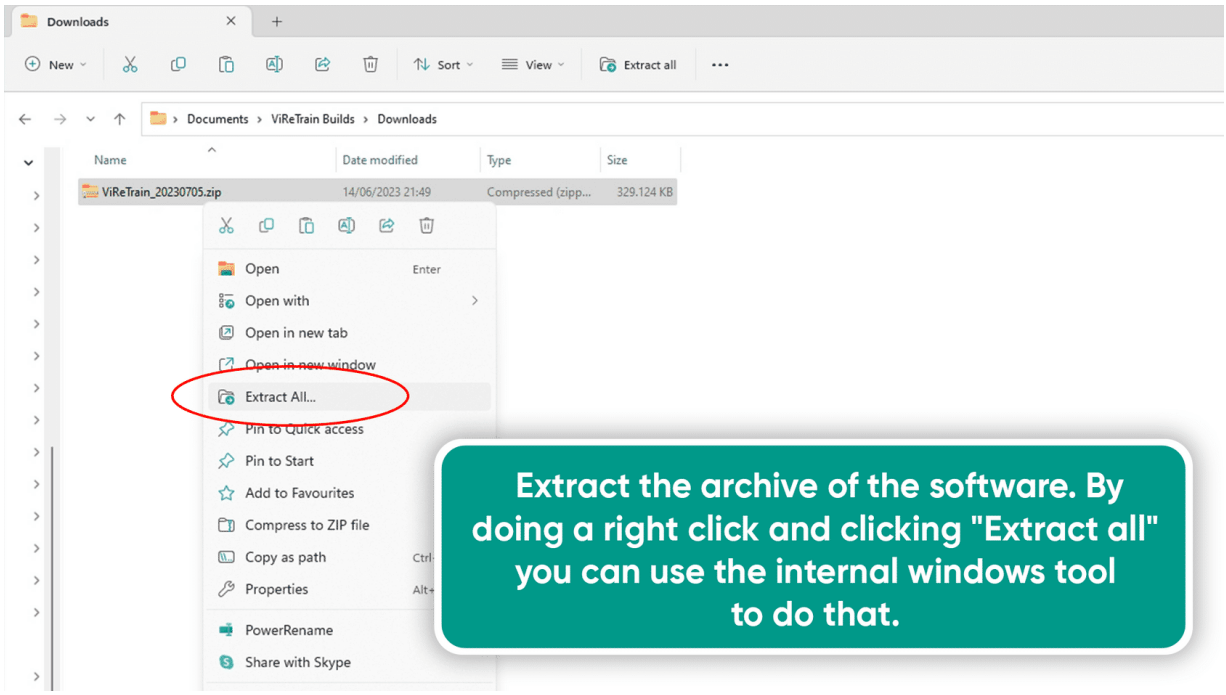
The software can be accessed and downloaded from the ViReTrain website. Click on the button at right for the steps to download and run the software.

SOFTWARE

STEP 1 | STEP 2 | STEP 3

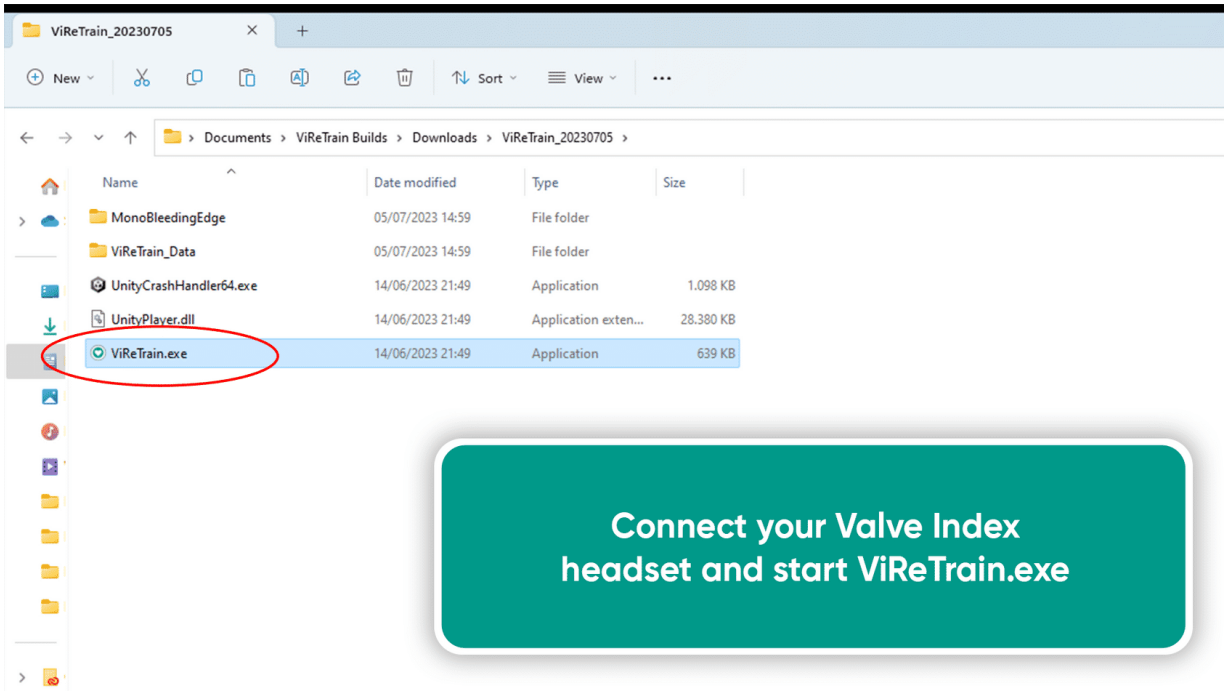
ViReTrain, available at [ViReTrain website]

STEP 1 | STEP 2 | STEP 3



Extract the archive of the software. By doing a right click and clicking "Extract all" you can use the internal windows tool to do that.

STEP 1 | STEP 2 | STEP 3


ViReTrain_20230705
New
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Application
1.098 KB
UnityPlayer.dll
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ViReTrain.exe
14/06/2023 21:49
Application
639 KB
Connect your Valve Index headset and start ViReTrain.exe

1.4 VR: Orientation and Health & Safety

Introduction

To ensure learners achieve a good sense of immersion within the VR scenarios, they should be provided with the opportunity to become familiar with the Valve Index headset and controllers, and associated interactions, prior to the planned VRS. This will assist in avoiding potential distraction which may lead to a lack of immersion and presence. As many learners may have no prior experience using VR, it is important there is a clear pathway to introduce and familiarise the learners with the hardware and software. Prior to immersion of learners in VRS, they should participate in an introductory class, including assessing eligibility and trial with the Valve Index Kit.

Assessing Eligibility

For health and safety reasons, it is important that the learners are asked to complete an eligibility assessment tool. See Table 4 for an example of an eligibility assessment tool. This will assist in identifying whether or not learners have previous experience with VR and, also, help identify those who may be at risk of side effects from VRS.

If a learner answers 'Yes' to any of the questions or has a serious medical condition, then the learner should be assessed by a medical doctor for suitability as a user of Valve Index VR kit.

1. Have you used VR previously?	Yes	☐	No	☐
a) If yes, how many times have you used it? _____				
b) If yes, have you ever felt sick during or after VR use?	Yes	☐	No	☐
2. Do you often get motion sickness when travelling?	Yes	☐	No	☐
3. Have you been diagnosed with any of the following?				
Epilepsy	Yes	☐	No	☐
Sensitivity to light or migraines	Yes	☐	No	☐
Heart condition	Yes	☐	No	☐
Are you pregnant (female students)	Yes	☐	No	☐
Other serious medical condition (please specify) ----------				

Table 4: Eligibility Screening Questionnaire (Adapted from: Southgate & Smith, 2017)

Trial with Valve Index VR Kit

Under supervision, as previously mentioned learners should have the opportunity to practice using the Valve Index headset and hand controllers. In addition, the VR tutorial on the ViReTrain website is helpful to orientate the learner to the functionality of the hand controllers, ViReTrain website.

Monitoring and Ensuring Safe use

Step 1

Having a “SPOTTER”

- It is helpful to have another person present when using the technology. This may be a nurse educator (facilitator) or another learner.
- Facilitator/Buddy can ensure, for the duration of the VRS, that the user is safe in the physical environment. For space requirements (refer to 1.2)
- Monitor response and observe for signs of sickness, dizziness or reported eye strain or headache.

Step 2

Breaks during the VRS

The timing and length of breaks may depend on how the learner reacts to VR. If they experience discomfort, they can exit the VE. Sitting still in a well-lit environment can help speed recovery from disorientation.

The following guidance helps minimize any adverse reactions, such as simulator sickness.

- Where a learner is demonstrating signs of discomfort, either verbally or nonverbally, the nurse educator can step in and ask the student if they wish to exit the VE.
- Regular breaks are encouraged if the VRS is of a longer duration.

Step 3

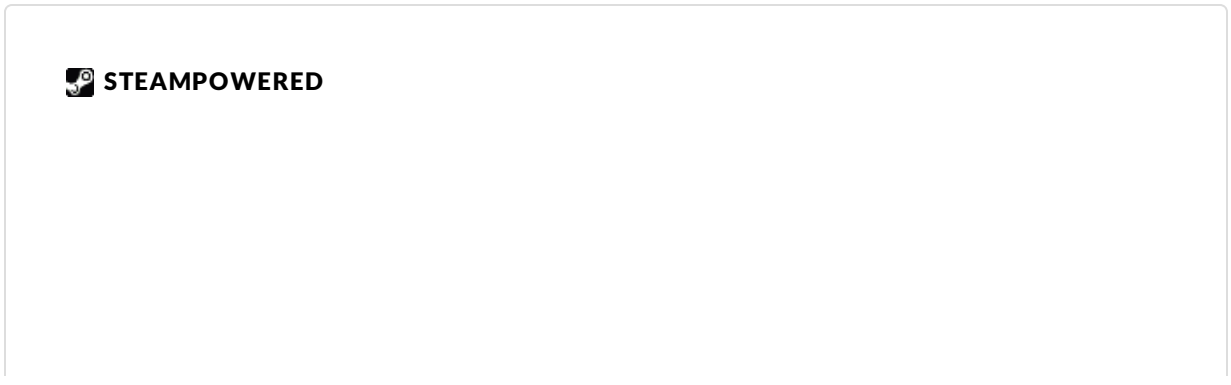
Managing Simulator Sickness and/or Dizziness

In the event a learner experiences motion sickness, a safety procedure must be in place. The following steps are recommended:

1. The learner is advised to take a seat.
2. A drink of water is offered.
3. The learner to remain seated until they feel the symptoms have subsided.
4. Should symptoms persist, the learner is encouraged to visit the Student Health Unit or their local primary care physician.

Storage and Cleaning

After the VRS, it is important to clean and store all equipment appropriately. It is advised that all equipment is stored in a dry, cool area, usually in a restricted area, which is accessible to staff and students as per local arrangements. For cleaning the Valve Index VR kit please follow the manufacturer's instructions as supplied with the Valve Index VR kit. This is also available at: https://help.steampowered.com/en/



Steam Support

Log in to your Steam account to get help with your Steam games, contact Steam Support, request refunds, and more. Help is also available if you can't log in, need to reset your password, or recover a hijacked account.

READ MORE STEAMPOWERED >

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Southgate, E., Scevak, J, Smith, S.P. & Buchanan, R. (2017). *VR School Health and Safety Survey.* Newcastle, Australia: Digital Identity and Curation (DICE) Research Network. Available from: https://vrschoolresearch.files.wordpress.com/2017/07/vr-school-project-health-and-safety-screening-survey-docx.pdf

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VR best practices, available at VR best practices, Co Spaces Edu

The websites were last accessed August 2023.

2.1 ViReTrain Modules

Introduction

The three modules are available on the ViReTrain website and nurse educators can incorporate them into their nursing curricula to support experiential learning. In VRS, students can practice application of knowledge, skills, and attitudes as they progress through the VR scenarios.

Each module represents a standalone unit of teaching and learning. The modules are best positioned in the curriculum where the emphasis is on acquisition, application and practice of nursing competencies needed in the clinical workplace.

Modules

In this handbook a module is understood as the learning process which, besides the VRS, also includes other learning activities. From a recent literature review on VRS in health education pedagogical and didactic planning is inadequately reported, if at all (Pernica et al., 2023). In contrast, the modules developed in this project have been prepared based on the pedagogical concept described in Part 1. A set of competencies is linked to each module (Figure 1). The competencies, in turn, inform the content of the module and thus the choice of learning activities.

The modules contain the VR scenarios, where complex authentic patient cases are presented to the learner in the VE. These cases are similar to patients that newly qualified nurses will encounter in clinical practice. Practice of competencies in the context of situations in which the competencies are required, for example in the VR scenarios, leads to learning that is more conducive to application. The modules are suitable for European outcome-based nursing curricula.

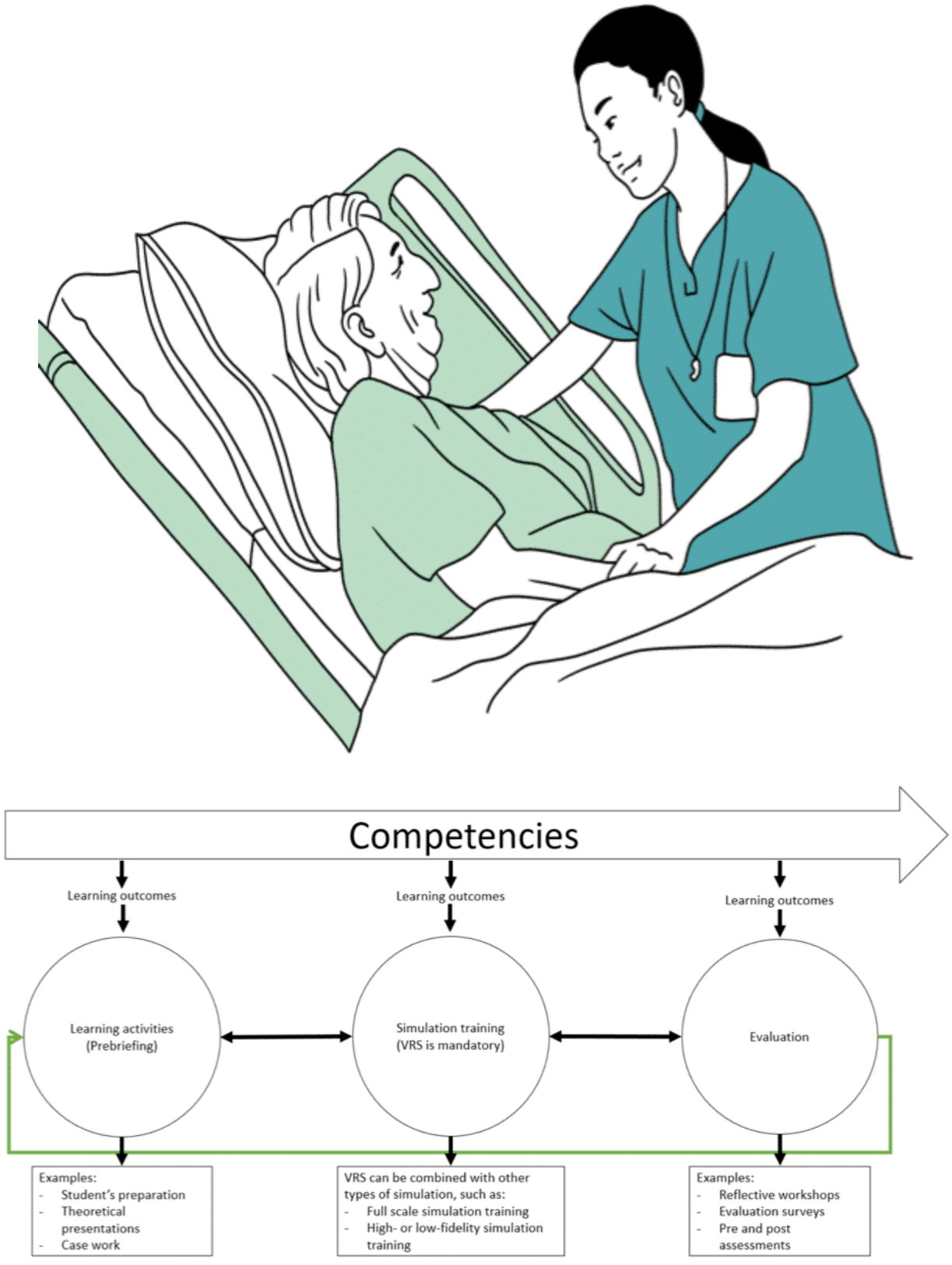

Figure 1: Module Competencies Informing Key Module Components

The competencies and learning outcomes determine the content and learning activities of each module. For further detail on competencies and learning outcomes see section 1.

JUMP TO SECTION 1

Learning Activities

A set of learning outcomes is linked to each learning activity; this informs the content of the learning activity. These learning activities take place, for the most part, at an earlier time in the module i.e., before the VRS. At the same time, it is not necessary to have completed all the learning activities before the VRS takes place. Examples of learning activities in each domain are presented in table 1. As you can see in figure 1 and table 1, the learning activities are aligned to the learning outcomes of the modules.

Learning outcome Domain	Domain examples	Learning activities examples
Knowledge	Empirical Personal Aesthetic Ethical from: Evidence-based guidelines and Standards theories and expert opinions Case studies Clinical experience	Large group teaching Case-based learning Group projects Assignments Self-directed learning Low fidelity simulation High-fidelity simulation VRS Clinical placements / internship
Skills	Communication skills Procedural skills Nursing process skills	Videos with reflective practice Low fidelity simulation High-fidelity simulation VRS Clinical placements / internship
Values & attitudes	Compassionate care Empathy Patient advocacy Patient-centred communication	Case-based learning Reflective workshops Low fidelity simulation High-fidelity simulation VRS Clinical placements/internship

Table 1: Domain Learning Outcomes and Learning Activities

Evaluation

Evaluation of the module can address presentation, delivery, support from the nurse educator and other staff, and evaluation of individual learning activities (including the VRS). There are many approaches to module evaluation and nurse educators can take into consideration structure of their nursing curricula when planning evaluation of the module.

Referencing the Kirkpatrick Model of evaluation of learning programmes, Level 1: Reaction, which captures the perceptions of the learners, can be conducted using an evaluation questionnaire (Kirkpatrick, 2006).

Reflection workshops are another approach where a space for reflection is created. The reflections are directed by the module competencies. The reflections are framed using reflective questions presented by the nurse educator. Special attention should be paid to the learners' reflection of their own learning and how their learning can have an impact on later learning in practice. For example, reflection on how the module's situated learning context can be transferred to a practice-situated learning context. In addition, reflection on planned changes in performance in clinical practice, if any, based on the learning from the module, can be included in the evaluation. It is recommended that the nurse educator includes evaluation data in subsequent revision of the module (indicated by the continuous green line in Figure 1).

The next section presents an approach to assessment of this module. A pre- and post-assessment of learning outcomes (linked to the module competencies and educational heuristic) is another form of evaluation of the module and/or individual learning activities thereof. This aligns to Level 2: Learning, of Kirkpatrick's model (2006) of evaluation of learning programmes.

Assessment

Formative assessment can take place during the learning activities and "works best when it is (1) embedded in the instructional process and/or clinical workflow (2) provides specific and actionable feedback (3) is ongoing and (4) is timely." (Norcini, 2018, p.1103). Observation of performance and provision of feedback are core elements of formative feedback. The learner is supported in their acquisition of module competencies in the domains of knowledge, skills, and attitudes.

Summative assessment aims to determine if the learner meets the agreed minimum level of competency and can progress to the next year of the curriculum or to successful completion of the curriculum.

A combination of written and practice assessments is recommended to assess module competencies. Examples of written assessments suitable to assess cognitive competencies, are single best answer questions and short answer questions. Assessment of skills, values and attitudes is best done using performance-based assessments such as Objective Structured Clinical Examination (OSCE). The authors recommended the NBME Item Writing Guide when composing single best answer questions. For performance-based assessments, such as OSCEs, the authors recommend the Consensus Statement and Recommendations from the 2020 Ottawa Conference, The Objective Structured Clinical Examination (OSCE), AMEE Guide No. 81. Part I (Kahn et al.,2013) and The Objective Structured Clinical Examination (OSCE), AMEE Guide No. 81. Part II (Kahn et al., 2013).

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2.2 VR Simulation

VRS

The structure of VRS is similar to physical simulation, namely,

- Prebriefing
- VRS
- Debriefing

PREBRIEFING

Prebriefing is aimed at establishing a psychologically safe environment by providing the necessary information to learners for their successful completion of the VRS (Badowski et al., 2020). Through preparation and prebriefing, the nurse educator prepares learners for both the educational content and the VRS.

WHAT ARE THE GOALS OF PREBRIEFING? | WHAT SHOULD BE INCLUDED IN THE PREBRIEFING? | WHEN TO CONDUCT THE PREBRIEFING?

- Establish an environment of integrity, trust, and respect (Psychological safety)
- Agree a "fiction contract" with the learners
- Discuss and agree confidentiality with learners
- Set the scene for the VRS, e.g., expectations such as roles & evaluation
- Review the learning outcomes
- Present the scenario briefing script (see below)

WHAT ARE THE GOALS OF PREBRIEFING? | WHAT SHOULD BE INCLUDED IN THE PREBRIEFING? | WHEN TO CONDUCT THE PREBRIEFING?

This handbook follows the INACSL standards committee guidelines (Watts et al., 2021), which includes the following in prebriefing:

- Establish a fiction contract. Given the nature of a simulated learning environment i.e. acting as if things are real, poses a challenge to both the facilitator and the learner. The 'fiction contract' requires the facilitator to do whatever is possible to make the scenario/simulated environment as real as possible and in return, the facilitator seeks a voluntary commitment from the learners to reciprocate this approach. This mutual commitment is key to a quality

learning experience (Rudolph, Raemer & Simon, 2014). For example, having explained to learners that the VE is set-up to mimic the clinical environment as closely as possible, the nurse educator asks learners "as much as you can to act as if everything is real".

- Establish ground rules regarding learner expectations. Learners need to know it is okay to make mistakes during the VRS. Explain reflection and learning from mistakes will be addressed during debriefing.
- Confidentiality regarding the performance of learners during the VRS is paramount to establishing psychological safety. In addition, learners should be asked to keep details of the VR scenario confidential, in order to protect the integrity of the VRS for future learners.
- The learning outcomes of the VRS are reviewed and discussed with learners.
- Recording the VRS: The 2-D casting of the VRS can be recorded. The purpose of the record and conditions of recording should be agreed with learners. Issues such as storage and access to recordings should be transparent and agreed at local level with relevant stakeholders (Programme Directors, Nurse Educators, Learners).

WHAT ARE THE GOALS OF PREBRIEFING?	WHAT SHOULD BE INCLUDED IN THE PREBRIEFING?	WHEN TO CONDUCT THE PREBRIEFING?

Most educators conduct the prebriefing right before the VRS. It can be conducted in advance of the VRS if necessary; however, prebriefing as close to the start of VRS as possible is recommended.

Learner dress code should be according to local guidelines. We recommend learners are dressed as they do when in clinical practice - e.g. wear scrubs.

Also, learners should adhere to Infection Prevention Control (IPC) measures in their attire e.g., neat, and tidy, hair tied back, nails short, no jewellery.

Health and Safety in VRS

Nurse educators must ensure they are familiar with all health & safety considerations and mitigation steps as detailed in Part 1.4 of this handbook.

Nurse educators must ensure they are familiar with all health & safety considerations and mitigation steps as detailed in Part 1.4 of this handbook.

JUMP TO 1.4

Casting

Casting the VRS onto a projector or PC/laptop screen will assist in sharing the student's experience with others. This allows the nurse educator (facilitator) to share the VRS with other learners, such that they can observe and learn during the VRS and in the debriefing. For the learner in the VRS, it means they will be able to have their experience and actions 'cast' or shared during the VRS.

Briefing Script (Briefing)

A briefing script should be used to ensure that all learners consistently hear the same information (INACSL Standards Committee - Watts, et al., 2021). This includes an introduction to the scenario. The following details should be included:

- [ ] Where the VRS is taking place / location e.g., in hospital ward, in nursing home
- [ ] Which day of the week and what time of day it is in the VRS
- [ ] Approximate duration of VRS and indicate if the nurse educator can decide to end the VRS early
- [ ] Briefing script, like a patient handover in clinical practice
- [ ] Any additional information which supports maximum learner engagement in the VRS e.g., technical information on engaging in the VE. Examples of this include how to contact the doctor or how to measure a virtual patient's pulse

Prebriefing Checklist

- [ ] State the learning objectives/ review learning outcomes
- [ ] Agree a fiction contract
- [ ] Agree on confidentiality
- [ ] Set expectations - including ground rules
- [ ] Clarify roles (learner, observer/s, nurse educator)
- [ ] Briefing (using briefing script)

VRS

During the VRS, the nurse educator plays a facilitatory role and needs to be completely familiar with the VR scenario.

The nurse educator's role includes the following:

1. Supporting the learner if challenged and "stuck". This could be done by asking a second learner to join the first learner to work as a team. The first learner will continue to use the Valve Index headset and controllers i.e., be immersed in the VRS, while the second learner will observe the simulation virtually i.e., as cast on a screen/monitor. In this way if there are other learners in the classroom, they can also follow the scenario as it progresses.

2. The nurse educator can decide to have a second learner in place to join the first learner at a point in the VRS where they judge the (first) learner needs help. Alternatively, the nurse educator can decide to have a second learner in place from the start, such that they work with the first learner as a team in the VRS.

3 Carefully observing the learner for signs that they are overwhelmed and/or not coping with the challenges posed in the VRS. In this case the nurse educator can decide to end the VRS early. Whatever is decided the safety and welfare of the learner must be prioritised, such that the experience is one that they can build on to advance their knowledge and skills.

4 It is recommended that the nurse educator experiences the VRS using the Valve Index headset and hand controllers themselves, such that they are both familiar and experienced with the scenario from start to finish.

5 Take notes of observations that may be discussed during the debriefing – see also debriefing section below.

DEBRIEFING

Debriefing is a reflective process that occurs (immediately) after learners have participated in the VRS. It is led by a trained facilitator who uses an evidence-based debriefing model to assist learners to reflect and learn from the experience and assimilate their learning into clinical practice. Another way of describing simulation debriefing is as follows:

"Learning conversations between two or more people occurring during or after a simulated event that involves reflection on performance, identification of performance gaps, exploration of the rationale for behaviours, and seeking solutions."

Chris Nickson - Life in the Fastlane

The focus of debriefing is on the learner's performance during the VRS. There are several debriefing models. Here we describe the 3D Model of Debriefing by Zigmont et al. (2011).

Essential Elements of the Debriefing Process are:

- Psychological safety (able to act without fear of consequences)
- Debriefing stance or assumption (i.e. treat each other with positive regard – that they are doing their best and want to learn)

- Establish debriefing rules (e.g., confidentiality, treating the simulation as if it were real, focus on improvement)
- Share mental model (so that everyone is aware of the events that took place in the VRS)
- Address learning objectives (either pre-determined or learner-generated)
- Open-ended questions (encourage self-reflection and convey curiosity)
- Using silence (allows participants to formulate thoughts, process events, reflect, and form considered responses)

3D Model of Debriefing

The phases, which should be conducted in sequence, are:

3D Model of Debriefing

The phases, which should be conducted in sequence, are discussed in this interaction.

Step 1

Defusion

Reflective observation takes place here, where the learner is encouraged to "vent" emotions and reflect on what happened during the VRS. Here the facilitator elicits the learner's reactions and emotions.

The VRS may have provoked emotional responses in the learner, and it is important that they are given the opportunity to talk about them. At the same time the facilitator should be aware that not all learners will want to do so, and this should not be 'forced' on learners.

The facilitator also invites the learner to recap and clarify what happened during the VRS. By verbalising their thoughts and through reflection, the facilitator guides the learner in conducting a needs analysis of learning objectives important to the learner.

Step 2

Discovery

The purpose of the discovery phase is to facilitate self-reflection of the learner on their own performance. This allows analysis and evaluation of performance through reflection.

During the simulation, the facilitator will have taken notes on behaviours of the learner and the positive/negative outcomes of these behaviours, which can be addressed during Discovery. In addition, the facilitator also has the option to focus on opportunities for improvement, specifically related to points of emotional responses identified during Defusion.

Using a debriefing tool, such as the Advocacy–Inquiry Debriefing Tool - PAAIL (see web resources). The facilitator prompts reflection by sharing an objective perspective on the VRS. The video recording of the VRS can support reflective observation, providing an accurate view of the VRS. The learner is actively encouraged to recall their experience and self-reflect on their behaviour.

This is followed by analysis of behaviour – "Abstract Conceptualisation". Briefly, the learner has space to think about the sequence of events, actions and behaviours, and outcomes that occurred during the VRS.

This is followed by inquiry into the decision-making process (mental model) used by the learner, and identification of gaps or opportunities for learning.

The final part of Discovery is Analogical reasoning. The facilitator invites the learners to recall past experiences (from clinical practice) that were analogous e.g., "how have you handled this in the past?"

Alternatively, observers or the facilitator can offer analogues for discussion. By comparing previous experiences/analogues, learners expand their mental models (decision-making process) and incorporate new concepts.

Step 3

Deepening

The purpose here is "an explicit connection of the learning (new or target mental model) to practice (the environment) aka synthesis" (Zigmont et al., 2011, p. 57). This is greatly enhanced by an immediate active experimentation on an actual or simulated patient.

With VRS, this can be facilitated by providing the learner with the opportunity to go through the VRS once again. This can be done with or without the facilitator being present. Feedback (automated) will be provided to the learner (see section on feedback below). Time and logistical constraints will determine if the learner can repeat a VRS.

If this is not possible Deepening can be facilitated by prompting and nudging learners to how they can connect their learning/new mental models to clinical practice.

At the end of Debriefing, the facilitator provides a summary of lessons learned. This should be a succinct description of topics that were covered during debriefing and new learning/solutions. Facilitators should link the learning objectives with lessons learned.

Evaluation

Evaluation of the VRS can address learner satisfaction, presentation, delivery and support from the nurse educator and other faculty. Several instruments are available across different categories of evaluation of simulation. The SUS (system usability scale) is reported in the literature in evaluating the usability of VRS (Brooke, 1996).

A repository of instruments can be found by clicking on the INACSL website https://www.inacsl.org/repository-of-instruments. Student satisfaction with simulation can be measured, for example, with the Student Perception of Effective Teaching in Simulation Scale and Educational Satisfaction Scale. Debriefing can be evaluated using the Debriefing Assessment for Simulation in Healthcare (DASH).

Assessment

Formative assessment takes place during the debriefing phase of the VRS. Formative assessment "works best when it is (1) embedded in the instructional process and/or clinical workflow (2) provides specific and actionable feedback (3) is ongoing and (4) is timely."

(Norcini et al. 2018, p.1103). The debriefing process in the VRS is aligned to these criteria, providing a powerful tool for feedback and formative learning.

Summative assessments include written and practice assessments, to test acquisition of module competencies. For example, single best answer questions (SBAs) can be designed to test application of knowledge in the provision of nursing care in clinical practice. This can be done using a clinical vignette. The NBME Item Writing Guide provides a step-by-step guide on writing SBAs for the clinical sciences. Performance-based assessments, such as Objective Structured Clinical Examination (OSCE), can be designed to assess students' competency in the VRS learning outcomes.

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Debrief2Learn – Podcast 004: https://debrief2learn.org/building-a-safe-container-for-learning/

Free online course: "Essentials in clinical simulations across the health professions" by Pamela R. Jeffries.

INACSL Standards Committee (2021). Healthcare simulation standards of best practice simulation design

NBME Item Writing Guide, available from: https://www.nbme.org/item-writing-guide

Online training program: INACSL Simulation Education Program (ISEP)
Simulation debriefing LIFE IN THE FAST LANE, available from:
https://litfl.com/simulation-debriefing/

The websites were lastly accessed in August 2023.

2.3 Module 1: Surgical Nursing Care

Module Leads: Luisa Groddeck, Jette Lange, Peter Niemann & Nadin Dütthorn

Münster Department of Health, Münster University of Applied Science, Germany

Module Description

This module focuses on “Taking care of patients with complex surgical problems", and is suitable for general nursing students.

Four learning units were created with incrementally increasing complexity, in terms of number of participants involved, progressing from unit 1 through to unit 4. First, there is a single learner (activation of prior knowledge - what the learner already knows about perioperative care e.g., from clinical placements). The VR scenario can support the learner to gain a practical and personal insight into caring for a patient in the postoperative period. Learners develop their own questions on the topic and gain intrinsic motivation to answer these questions in subsequent units. The first unit refers to already existing knowledge that can be expanded on and deepened.

In the second learning unit the view and emotional feelings, as aspects of caring and emotional labour, are included (gaining competence - what is needed to know about professional care for patients with complex problems in surgical settings (patient-nurse interaction). In this unit, the patient has a greater level of complexity, in terms of their health problems, which are not as predictable as those presented in the first unit. Here learning activities can focus on exploring the cognitive aspects as well as evidence-based knowledge. Furthermore, the skills training can facilitate specific psychomotor learning outcomes such as hygienic wound dressing, and procedures and standards of postoperative care, for example urinary

catheterisation. Lectures can focus on the knowledge and competencies of the module. At the end of unit 2 the VR scenario helps learners to elaborate and practice assimilation of skills together with knowledge gained in a more complex environment of caring for a patient after a surgical operation. Thus, the learners focus more on mastering the complexity of the situation.

The third learning unit deals with the perspectives of family members and healthcare professionals, perspectives which may differ from those of the nurse. Here learners reflect on their professional attitude and professional role in the context of a multidisciplinary and multi perspective learning environment. Learners gain insight into the emotional and values-based perspectives of relevant stakeholders (family members, other healthcare professionals) which can broaden their understanding of the unique situation, enabling them to apply problem-solving competencies within that context.

The fourth learning unit (how to reflect societal, institutional and individual contradictions-dealing with ethical dilemmas) brings in the perspective of society on conflicting and, at times, contradicting topics. Here, nurse educators and learners reflect on ethical dilemmas and contradictions that can arise between different perspectives and institutional requirements. This reflects on dealing with dilemmas and understanding the professional side of caring. The VRS supports learners to experience providing nursing care to an individual patient, addressing the patient needs holistically. In the debriefing phase, learners have the opportunity to reflect on the context, the different perspectives, and the caring aspects of the patient.

Therefore, the VR scenario can be used flexibly in the different units depending on the intention (Figure 2).

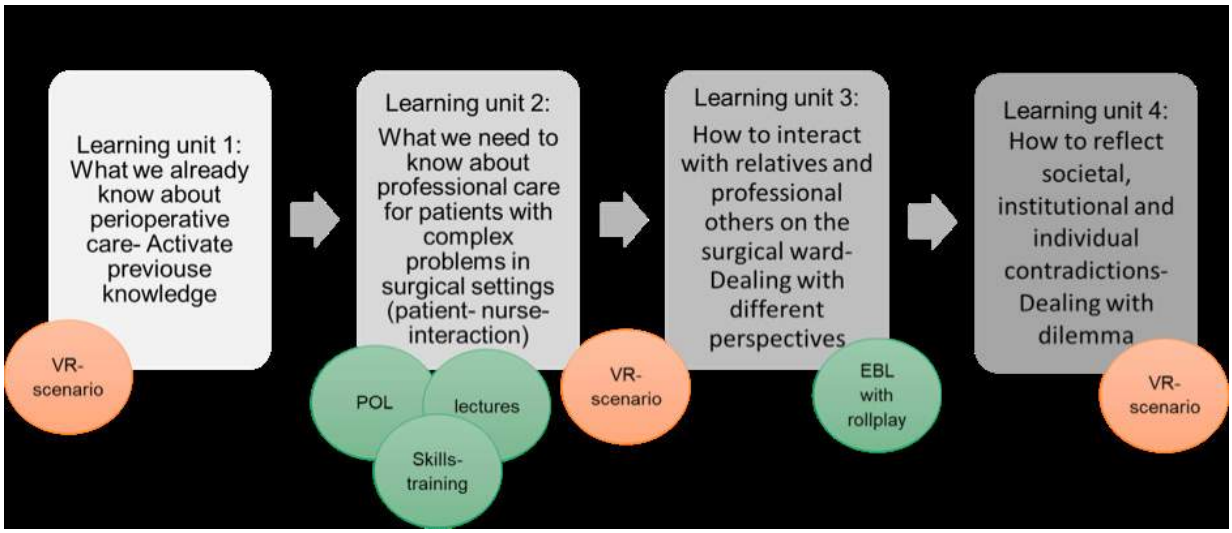


Figure 2: Suggestions At Which Points the VR Scenario Can Be Used In The Module

Module Educational Heuristic

As outlined in Part 1 of this handbook, an educational heuristic was created to guide the modules and VR scenario development. The content included is the focus of various sources (such as narratives, guidelines and trials). The educational heuristic for this module is depicted in Table 2.

> See References and Web Resources below for a list of evidence-based guidelines, research outputs and patient care pathway examples on technical knowledge from the nurse, patient and family and health care system perspectives. The educator is reminded that the evidence-base is regularly updated based on new research in the field.

	Perspective Nurse	Perspective Patient/Carers	Interest Health Care System/ Organisation
Technical knowledge *Students know and explain...* Scientific standards, Evidence Based Knowledge, Guidelines, Literature reviews	Forms of interprofessional teamwork/ collaboration Expert standards in pain management, wound management, fall prevention, discharge management, bedsore prevention, facilitating mobility of patients* Principal of counselling Managing vital signs* Standards for nutrition Knowledge of Surgical procedures* Procedure of the Nursing process* Care in the event of complications e.g. dizziness, feeling sick, bleeding, delirium*	Procedure of post- surgical care* Reasons for limited movements, way of mobilisation* Possibilities of pain management and (medical) treatment* Possibilities for complications* Caring-Options after the hospital stay/ Information about possible care situation in the future based on a future dependency of the patient	Financing of patient care and surgery Clinical pathway for hip-replacement Standards of post-surgical nursing care* Offered ways of post hospital care
Practical knowledge *Students realise/ understand...* Experience based practice, Aspects of Caring: emotional status, individual feelings, situative and contextual differences of a specific situation(scenario), tacit knowledge)	Interest in Individual nursing care; responding to patients' needs and feelings e.g. pain Handling feelings in contact with patients with delirium Counselling reference persons and relatives e.g. according chronicle disease development, dementia Awareness and understanding of violence in nursing care (patient-nurse relationship) Acknowledging patients need for help Acknowledge own limitations	Patient's need of being independent, wish for help Fear (of pain or annoying the nurse) Anxiety (during early mobilisation; inadequate treatment) Lack of understanding & reasons about symptoms and treatments (lack of orientation, self-mobilisation, anxiety/restlessness, aggression) Need for comfort on domestic aspects, dealing with the situation at home Concern that the future life and the organization of future life will change Providing with patients' personal items	Understanding the documentation system of the organisation Understanding epidemiological, demographic, social, economic and technological trends and their influences on the health care system according to its appearance in surgical care
Emancipatory knowledge *Students reflect on...* Challenges, contradictions	Objective vs. individual feelings (e.g. pain) Time for care vs wish for care	Patients need for attention vs. patient-oriented nursing care Individual decision vs. professional opinion Role of being a parent vs. being in need as a parent (role change patient) Role of being a child vs. responsibility and taking care for the parents (role change relatives) Providing support for patient vs. having enough resources (time, skills, general conditions)	Cost containment strategies vs. optimal treatment

Table 2: Educational Heuristic of Surgical Nursing Care Module

Please note, nurse educators have the flexibility to add/remove items from this heuristic, depending on considerations, such as, institutional nursing curriculum requirements, available time, and resources.

Module Competencies

Competencies are understood to be individual prerequisites (dispositions), which describe the ability and willingness of the learner to use knowledge and skills as well as personal, societal, and methodological abilities, and to behave in a professional manner to deliver safe person-centred care. It includes knowledge, skills, and attitudes. These competencies inform all other components of the module (Figure 3).

FOR THIS MODULE, SURGICAL NURSING CARE, THE COMPETENCIES ARE LISTED IN TABLE 3. THEY ARE RELATED TO THE COMPETENCIES FORMULATED IN THE GERMAN "TRAINING AND EXAMINATION REGULATIONS FOR THE NURSING PROFESSIONS" (PFLAPRV).

Cognitive:
Take responsibility for organising, controlling and designing the nursing care process for persons in complex surgical situations*
Negotiate the nursing care process with the team, patients and relatives for persons in complex surgical situations*
Investigate ways in which surgical patients can engage in meaningful activities, participate in cultural life, learn and play, and thus promote their quality of life and social integration*
Contribute to joint decision-making in inter-professional discussions in situations involving an ethical dilemma in the surgical setting
Take responsibility for planning and organising the nursing care processes for people in the surgical setting after the hospital stay

Evaluate the overall nursing care process in the surgical setting
Psychomotor:
Gather information and ascertain what support is available and identify resources and challenges (e.g., taking vital signs, pain measurement)
Delivering the nursing care processes and diagnostics for persons in the surgical setting, with a special focus on health promotion and prevention* (e.g., counseling, prevention of infection, bedsore or fall)
Communicate effectively with other healthcare professionals in the surgical setting*
Fully comply with hygiene standards and take co-responsibility for infection prevention in the surgical setting*
Observe and interpret care phenomena and complications* (e.g., delirium, nausea or bleeding)
Provide wide-ranging support and assistance regarding invasive diagnostic and therapeutic measures in the surgical setting (e.g., management of medicines)
Support assessments of nursing diagnoses and the necessary consequences for the treatment of patients in the surgical setting (e.g., mobilisation and nutrition)
Where necessary, adapt actions on an ongoing basis*
Recognise and act when the risk of being over- or under-challenged occurs (e.g., ask for help)
Document

Attitudes:
Respect the right of self-determination in complex surgical situations
Support the realization of human rights and codes of ethics in complex surgical situations*
Built short- and long- term relationships which are characterized by empathy, respect, attentiveness and congruence*
Reflect on conflicts which are emerging or have arisen in the provision of nursing care and develop means of mediating in and resolving conflicts*
Recognize the influence of general social developments, economic demands and technological, epidemiological and demographic trends on supply contracts and structures within the health and social welfare system
Take on co-responsibility in the provision of interdisciplinary nursing care and treatment to patients

Table 3: Module Competencies

*Denotes competencies addressed in the VRS.
Please note, nurse educators have the flexibility to add/remove competencies; this will be based on considerations such as institutional nursing curriculum requirements, available time and resources.

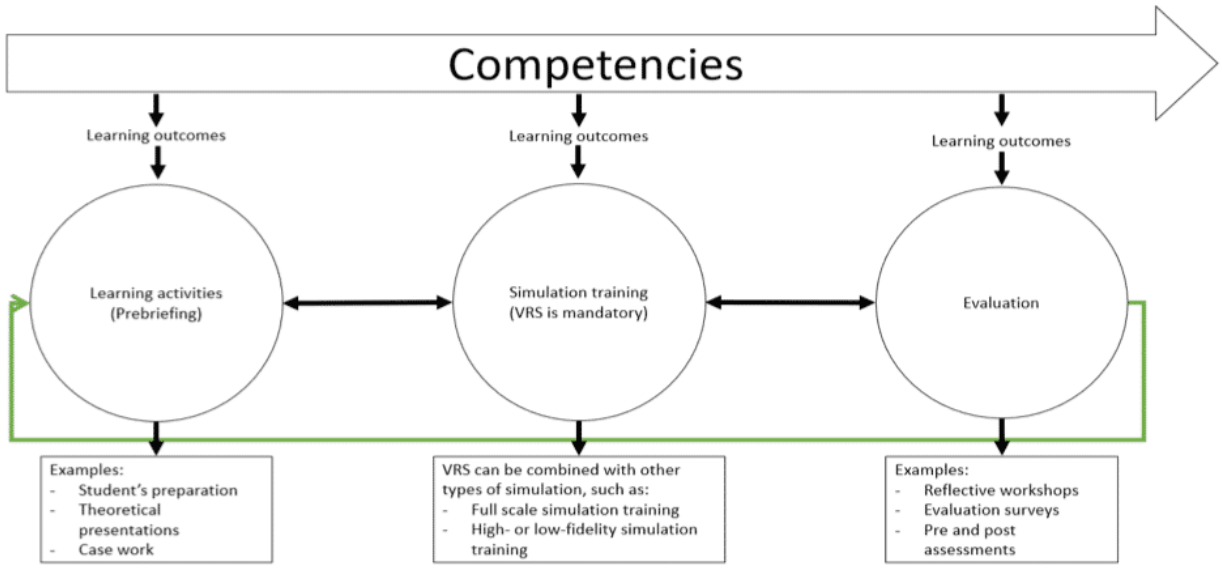


Figure 3: Module Competencies informing key module components.

Figure 4: Adam Wagner (Patient)

VR Scenario Development

To support the achievement of the module's competencies, the VR scenario "Surgical Nursing Care" was developed. The process of developing an authentic and complex scenario is

described, briefly, as follows:

1. Based on various field reports of involved participants (nurses, patients, relatives) common phenomena in the field of surgical nursing were identified and integrated to a storyline
2. Possible learning outcomes were identified and aligned with the module
3. The storyline was created, and a visual version was checked for implementation by the technical partner
4. Experts in the nursing field trialled playing Beta-Versions of the VR scenario and adjustments were made based on the feedback.

VR Scenario Storyline

The learner takes on the role of a newly qualified Registered Nurse (RN) working on the surgical ward, and is tasked with taking care of Mr. Adam Wagner (Figure 4), born in 1941. He fell at home and fractured his femur. He underwent a left hip arthroplasty under general anaesthetic. Mr. Wagner has a background medical history of hypertension, arthritis and parkinson's disease. His mobility was already limited before the fall.

The scenario starts with Mr. Wagner back on the ward, having been moved from the recovery room. Marie, a supervising nurse, asks the learner to attend to Mr. Wagner's needs and measure his vital signs. She also asks if the learner knows what an arthroplasty is.

The goal of the scenario is to structure and execute the post-operative tasks in a meaningful way and deliver to a report to the supervising nurse Marie. However, as it regularly happens in reality, different people and additional tasks constantly thwart the plan.

There is a "main path" that can be followed while playing the scenario:

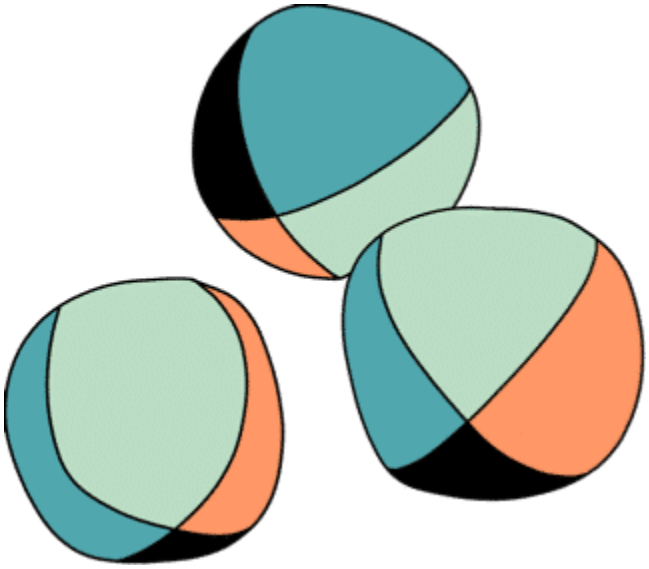
- First the learner can greet the patient and notice that there is a lot of "stuff" on the bed that needs to be placed appropriately (urine catheter, infusion, drain, sick bag, etc.).
- Only after this is managed, should further intervention be taken (pulse, BP, temperature, pain, wound inspection, inspection of the leg).
- Some vitals can be documented in the tablet (pulse, BP, temperature, and pain).
- The patient has some questions concerning mobilisation and nutrition.

- The scenario ends after successfully reporting to Marie, the supervising nurse. The reporting is possible via phone or by going to her in the nursing station. Marie will ask the student about the tasks and whether they have all been completed or not. A student can choose to be untruthful to Marie if they so wish.

To mimic real life, interruptions to the "main path" occur after fixed times within the scenario:

- A colleague arrives and asks to borrow the POC glucometer. The learner can choose to give the glucometer to the colleague or refuse to do so.
- Mr. Wagner will ask for his phone which is locked in the room's safe. The learner can decide to retrieve or not Mr Wagner's phone from his safe. In order to retrieve the phone, the student will need the code to the safe.
- The next interruption is Mr. Wagner starts to feel nauseous. If he is given the sick bag on time, he vomits into the bag. Otherwise, he will vomit on the sheets. If this happens, the student will need to clean Mr Wagner and his bed. He should feel good immediately. Vitals are stable.
- The last interruption is a phone call from the recovery room requesting transfer of another patient back to the ward. This information can be passed on to Marie.

There are additional items in the room that can be used but are not necessary for the scenario (see juggling balls below).



If the playing student doesn't carry out any reasonable task, Mr. Wagner will start to complain. If nothing happens subsequently, he will call Marie. The learner is then given a further chance to complete the outstanding task. If the learner doesn't complete the task, the scenario will be

concluded by Marie who takes over the patient's care and sends the learner to the nursing station.

VRS

Learning Outcomes

At the end of the VRS, the learner should be able to:

It is recommended nurse educators;

1. Are familiar with Part 2.2 which explains how to run a VRS
2. Are familiar with Part 1.4 which details health and safety considerations running a VRS

PREBRIEFING | BRIEFING

This process is extensively described in section 2.2. The prebriefing includes:

- Setting the ground rules
- Establishing the fiction contract
- Setting expectations and agree confidentiality
- The VRS duration will be 15-20 mins (approx.)
- Indicate if the nurse educator can decide to end the VRS early
- Clarify roles

PREBRIEFING | BRIEFING

The following brief script is to introduce the learner to the VR scenario before they enter the VRS.

> In this scenario you care for Mr. Adam Wagner, born in 1941. He has undergone a hip replacement after he fell at home and fractured his leg. He also suffers from hypertension, arthritis and Parkinson's disease, which limits his mobility.
>
> He lives at home with his wife and receives help from an ambulatory nursing team who visit him twice a day. His daughter, who lives close by, also gives great support. She accompanied Mr. Wagner to the hospital and has already placed some personal belongings in the room.
> The scenario starts after Mr. Wagner has been brought to the ward from the recovery room. Nurse Marie will give you a report on his current condition. Afterwards, you can help Mr. Wagner to settle into his room.
>
> Your goal is to structure your tasks, complete these tasks and report back to Marie.
> The scenario can also end prematurely, you will notice if that happens.

The learner will enter the VRS. The nurse educator and other learners can view the VRS when casting is activated.

Debriefing

This stage is based on the 3D Model of Debriefing by Zigmont et al., 2011. This is also extensively described in section 2.2.

Defusing

Emotions, feelings, situation recap, practical knowledge

The learner talks about their experience and the emotions felt during the scenario.

Encourage the learner to talk about WHAT happened and how they felt.

If the learner does not start, they can be inspired by using the following questions:

- “How did it feel to be part of the scenario?”
- “How did you feel during the scenario?”
- “How do you feel now?”

If the learner starts to reason their actions, the nurse educator should bring the focus back to what happened and how that made them feel.

- “Let’s recap WHAT happened during that scenario so that we can then discuss WHY during the second part of the debriefing.”

Discovering

(Identify mental model, analyse the situation and happenings, practical and technical knowledge

The discussion focuses the reasons WHY something was done.

If the learner needs some guidance, you can use the following sentences:

- “Thanks for sharing the rationale. Has anyone else every experienced this? What did you do to deal with that situation and why?”
- “How might this situation have been different if you had used that strategy.”
- “I noticed that you did x in the y situation. I was curious about that action because... (Nurse Educator offers his own mental model about how to deal with y). Can you tell me why you did x?”

- “Another way to handle x is z (target mental model). If you had done z, how would that change y?”

Deepening

Transfer to clinical practice, identify contradictions, emancipatory knowledge

Find a connection to the clinical practice and future situations.

The following sentence may be helpful:

- “If you were to encounter a similar situation in the future, how would you handle it?”
- “How can you use the information we just discussed in your clinical practice?” “Can you think of other situations where this information could be applied?”
- “Did you experience any inner conflicts?”

Deepening

Possible topics for a discussion

Questions about surgical care:

- Handling interruptions, e.g., lost focus, ignoring questions
- Interaction with the colleagues, e.g, refusing to share the blood glucometer or not reporting truthfully to Marie in the final report

- Interactions with the patient, e.g., using options to talk to the patient
- Technical possibilities vs. anticipated real actions
- Hygiene, e.g., hand disinfection at the right moment
- Technical knowledge, e.g., questions about arthroplasty, tremor, post operative care

Deepening

Possible reflection on emancipatory knowledge

Challenges, Contradictions. Ethical considerations

Examples for the Surgical Nursing Care Scenario:

- Stress: Time for care vs wish for care & patients need for attention vs. patient-oriented nursing care
- Reactions: Objective vs. individual feelings
- Ethics: Cost containment strategies vs. optimal treatment

Summary

Highlight the Key lessons learned

- Ask the learners: "How do you feel now?"
- Highlight the key lessons learned; link to the learning outcomes

- Take more message:

" What is one thing that you can take away from this VRS to use in your practice going forward?"

Evaluation

Evaluation of the VRS can address learner satisfaction, presentation, delivery, support from the nurse educator and other staff. A number of instruments are available across different categories of evaluation of simulation. The SUS (system usability scale) is reported in the literature in evaluating the usability of VRS (Brooke, 1996).

A repository of these can be found in the INACSL website.Student satisfaction with simulation can be measured, for example, with the Student Perception of Effective Teaching in Simulation Scale and Educational Satisfaction Scale. Debriefing can be evaluated using the Debriefing Assessment for Simulation in Healthcare (DASH)

Assessment

Formative assessment takes place during the debriefing phase of the VRS. Formative assessment "works best when it is (1) embedded in the instructional process and/or clinical workflow (2) provides specific and actionable feedback (3) is ongoing and (4) is timely" (Norcini et al., 2018, p.1103). The Debriefing process in the VRS is aligned to these criteria, providing a powerful tool for feedback and formative learning.

Summative assessments include written and practice assessments, to test acquisition of module competencies. For example, single best answer questions (SBAs) can be designed to test application of knowledge in the provision of nursing care in clinical practice. This can be

done using a clinical vignette. The NBME Item Writing Guide provides a step-by-step guide on writing SBAs for the clinical sciences. Performance-based assessments, such as Objective Structured Clinical Examination (OSCE), can be designed to assess students' competency in the VRS learning outcomes.

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2.4 Module 2: Respiratory Nursing Care

Module Leads: Ida Lunddahl Bager, Christine Tram Widmer and Cathrine Sand Nielsen

Via University College, Aarhus, Denmark

Module Description

Module 2, like the other modules in ViReTrain, is aimed at final nursing students. Thus, the learning outcomes for the individual learning activities are characterized by a high degree of complexity. The complexity of the module consists of several factors (Table 4). Thus, multimodal learning activities are planned in the module, with which the students can work with different perspectives of complexity.

	Perspective Nurse	Perspective Patient/Family/Relatives	Interest - Health Care System/Organization
Scientific standards **Evidence Based Knowledge**	Care of and treatment to the patient with acute chronic obstructive pulmonary disease (COPD) exacerbation, regional guideline	Evidence-based knowledge, patient's perspective Evidence-based knowledge, family, and relative's perspective Nursing ethical guidelines	Prevention of hospitalizations (DSI, Danish Health Institute) Clinical pathway for patients with COPD; Regional and national´ Clinical guidelines on palliative care; Regional

Guidelines **Literature review**	Care of and treatment to the COPD patient with dyspnoea, regional guideline Clinical guideline for treatment of dyspnoea, national guideline Clinical guideline: COPD patients suffering from anxiety or depression, national guideline. NIV treatment, regional guideline Evidence-based knowledge concerning the nursing care perspective.	Legislation concerning the rights of patients and relatives.	and national International standards Legislation concerning the rights of patients and relatives.

	Nursing ethical guidelines		
Experience based practice. **Aspects of Caring: emotional status, individual feelings** **Situated and contextual differences of a specific situation(scenario)** **Tacit knowledge**	Nursing care theories on decision-making that involves multiple perspectives: Situated Clinical decision making (Gillespie) Self-care requisites (Orem) Care of the suffering patient (Morse) Nursing Process (Orlando) Nursing care of the patient in COPD exacerbation. E.g., Anxiety-breathlessness	Patient, family, and relative narratives Nursing care theories on decision-making that involves multiple perspectives: Situated Clinical decision making (Gillespie) Self-care requisites (Orem) Care of the suffering patient (Morse) Nursing Process (Orlando)	Understanding the importance of complex processes for the healthcare system. Including financial consequences of, for example, readmissions for this patient group. Understanding of ethical considerations from a societal perspective.

	circle, palliative nursing care Situational communication		
Challenges, contradictions	Care of the confused patient: To what extent must the patient be informed so that it is ethically justifiable? Assessment of own competencies or lack thereof in a clinical situation The learner's own reaction to being in a stressful situation. End-of-life, nurse perspective	Care of family and relatives: Ethical dilemma when a family member asks to withhold information from other family members. Nursing cares for anxious relatives who want answers. End-of-life, patient/family/relative's perspective	From a societal perspective: Increase in treatment options, but when is treatment discontinued? End-of-life, societal perspective

Table 4: Module 2 - Heuristic Grid

Figure 5: Margrethe Frederiksen (Patient)

Competencies and Learning Outcomes

Figure 6 shows the basic elements of the module. A set of competencies is linked to the individual module. Competencies are decisive for the content of the module and thus the choice of learning activities.

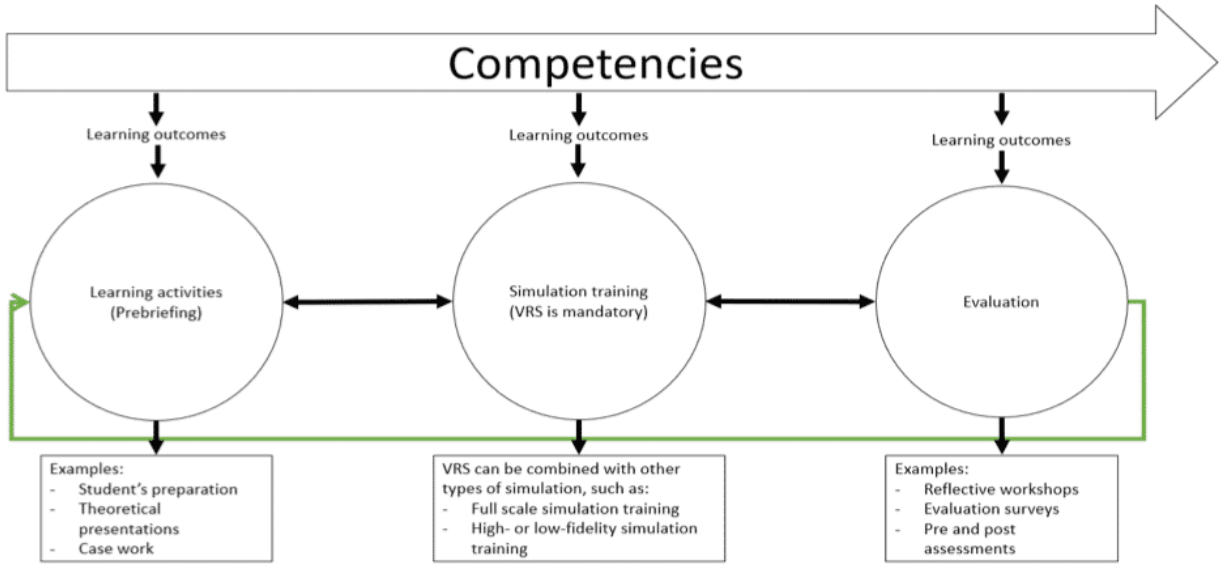


Figure 6: Module outline

Below, the competence objectives for the entire module 2 are set out. These are competencies which are achieved through all learning activities in the module.

KNOWLEDGE | SKILLS | ATTITUDES

- Seek, assess, and apply national and international practice, development and research knowledge prior to clinical decision-making and clinical leadership concerning the patient with COPD.
- Explain principles of nursing to the patient with COPD
- Apply theoretical knowledge in assessment of the patient with COPD.
- Apply the importance of involving relatives of the patient with COPD.
- Have insight into ethical guidelines and patient safety.

KNOWLEDGE | SKILLS | ATTITUDES

- Demonstrate clinical decision-making based on systematic observation, diagnosis, and assessment of the patient with COPD.
- Demonstrate prioritization, management, and coordination with team members.
- Demonstrate safe performance of decision-making concerning oxygen treatment and medicine administration.
- Demonstrate actions to achieve patient well-being. Including prevention of anxiety and shortness of breath
- Acknowledging relatives' needs in acute, critical, and complex nursing care.
- Independently identify, appraise, and apply national and international knowledge of practice, development and research arguing and reflecting the theme for the semester

- Argue for relevant use of information and communications technology in the profession in specific contexts.

KNOWLEDGE	SKILLS	ATTITUDES

- Demonstrate personal, professional responsibility, and keep up to date by identifying and understanding your own learning process and need for further development.
- Demonstrate courage and action in nursing and reflect on whether something could be done differently.
- Reflect on your strengths and weaknesses as well as your readiness to engage in unpredictable situations.

Learning outcomes

Listed below are learning outcomes that only apply to the VRS learning activity in module 2:

- Carry out a systematic data collection of the patient with a respiratory problem
- Carry out a relevant assessment of a patient with a respiratory problem
- Recognise the patient's physical, social, psychological, and existential needs and respond to them
- Demonstrate appropriate clinical decision-making and initiate relevant nursing actions for the patient with a respiratory problem
- Demonstrate relevant and advanced clinical leadership, including collaboration with other professions
- Priortise most relevant interventions
- Assess the patient's condition and act accordingly
- Evaluate the need for help on the basis of one's own competence

- Maintain presence in a stressful situation and respond accordingly

Learning activities in Module 2

Theoretical presentations and case work:

At the beginning of the module, the students are presented with a theoretical framework, which they use as part of their case work. We have chosen for the students to take the simulation case as a starting point, which contributes with data sets of a physical, social, psychological, and organizational nature.

In the learning process, the students focus on a COPD patient (Figure 5) and his/her course in the healthcare system. COPD is a complex medical problem, as this patient group often has co-morbidities. In addition, there are also social and psychological problems for which the students must make clinical decisions. For example, concerning relatives with different needs. Finally, there is also an organizational complexity. For example, how palliative care is implemented in the citizen's own home in collaboration with the municipality.

Through the case-based learning activity, the students apply the theory that they have read and worked with. The purpose is for the students to reflect on clinical decision-making and possible actions before the simulation training. Furthermore, the theoretical framework is a necessity as part of debriefing (Badowski & Wells-Beede, 2022).

Simulation training in Module 2

Module 2 consists of three types of simulation with the same patient: Skill training, VR simulation and traditional simulation:

First, skill training is to be carried out. Skills training means training in technical, as well as non-technical, skills based on evidence-based practice.

We suggest skill training prior to simulation training, so that the students are more familiar and confident with technical as well as non-technical skills before entering the physical or virtual simulation space with a high degree of complexity (Fuglsang et al., 2022). This gives the students the opportunity to immerse themselves in one skill at a time. This is with the intention of reducing their experience of complexity when they enter the simulated learning space,

where, in addition to skills, they also must deal with the patient and relatives' perspective, unpredictable situations and more.

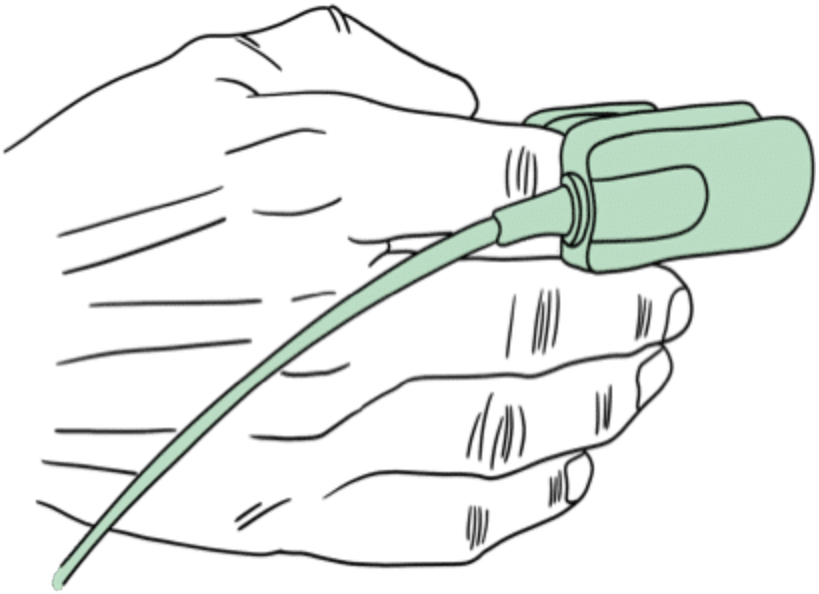
Consider the degree to which this learning activity should be facilitated. For example, to what extent the students themselves can facilitate peer to peer feedback during training of the skills. Here it can be advantageous if you create a clear framework for the activity, which includes links to learning resources such as clinical guidelines and clinical decision support tools. The focus of this learning activity is on caring for patients suffering from COPD. Examples of skills: Relief of shortness of breath, starting oxygen therapy, communication with patient and relatives, EWS, assessment of degree of shortness of breath, collecting sample materials and more.

Secondly, the VRS is to be carried out. Here, the focus is on care for the patient who is admitted acutely with worsening COPD (exacerbation). The care and complexity are primarily aimed at stabilizing the patient and assessing whether the patient's COPD has worsened. The scenario itself has a complexity, as the patient does not necessarily respond positively to the actions that the students have been presented with in the theoretical framework. Furthermore, there is no one correct way through the scenario to stabilize the patient.

Thirdly, traditional simulation training is to be carried out. If necessary, place this teaching the following day so that the students are not exhausted. In this scenario, the patient is discharged to her own home and the focus is on palliative care. We have chosen to carry out the last scenario physically, as the students must simulate a conversation where the focus is on the citizen's wishes in the last time. The complexity increases, as the spouse and children have different perspectives in relation to their wishes and thoughts for the future and end-of-life care. We assessed that these perspectives were not possible to carry out in VR simulation with the possibilities that this learning technology currently has.

Each simulation ends with a debriefing facilitated with an educator who is skilled and experienced in debriefing.

VRS in Module 2



PREBRIEFING | BRIEFING | DEBRIEFING

This process is extensively described in section 2.2. The prebriefing includes:

- Setting the ground rules
- Establishing the fiction contract
- Setting expectations and agree confidentiality
- The VRS Duration will be 15-20 mins (approx.)
- Indicate if the nurse educator can decide to end the VRS early.
- Clarify roles

PREBRIEFING | BRIEFING | DEBRIEFING

Just before the students enter the VR scenario, a briefing is carried out. Below is the brief script for VRS in module 2.

Margrethe has just arrived at the ward with her husband, Henrik. He sits next to the bed and holds Margrethe's hand. You are a nurse on the ward and receive Margrethe and Henrik in the patient room. The following data is collected upon arrival:

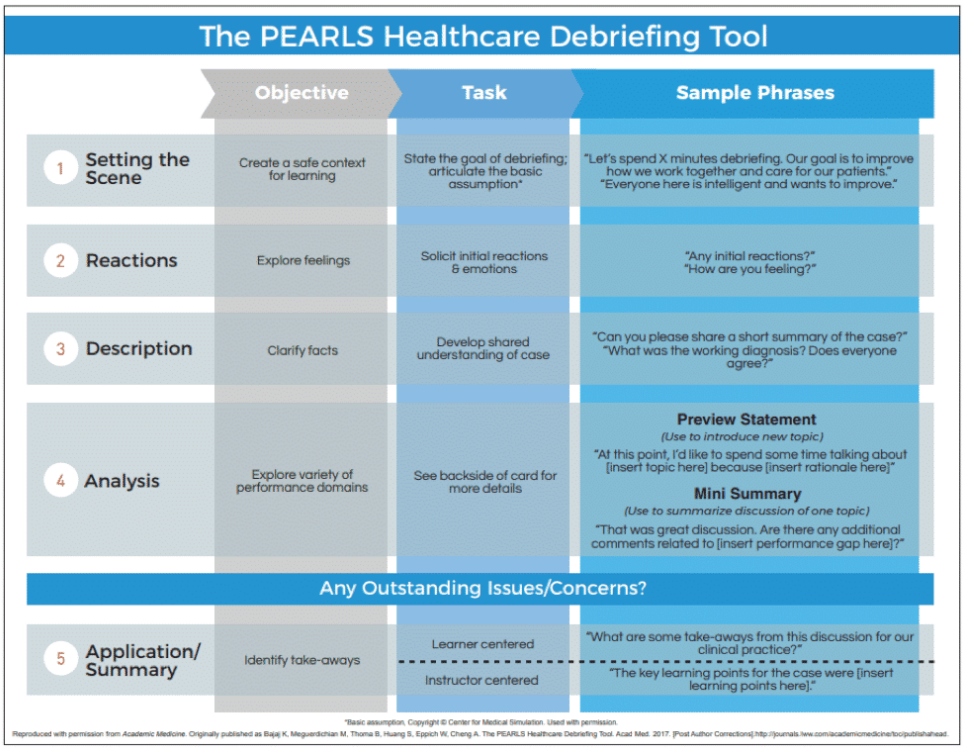
- Respiratory rate = 28. Prolonged expiration. Uses accessory muscles. Audible secretions. Oxygen saturation = 83% (5 L. O2/min.)
- Pulse = 120. Blood pressure =165/80. Capillary response = 4. Warm and moist skin
- Eyes are opened by verbal stimulation. Saying incoherent sounds. Unable to perform a motor examination, pupils equal and dilated
- TP = 39,6°C. Peripheral edema of the lower extremities. Blood glucose = 8 mmol/L

Henrik is nervous and asks: "It sounds so uncomfortable when she breathes. Does she have water in her lungs again? Oh no, it was so hard for her last time. It was about to kill her." Margrethe lies flat in bed with her eyes closed and makes moaning sounds.

The literature points out that there is still a need for further research into the framework and content of debriefing in VRS (Badowski & Wells-Beede, 2022; Garmaise-Yee et al., 2022). Therefore, you should pay attention to how you plan the debriefing. In this section we present a debriefing model that the authors have experience with as part of simulation training.

Debriefing in module 2 is based on 2 elements: 1) PEARLS debriefing model. 2) Data feedback from the scenario.

Below is the Pearls Healthcare Debriefing Tool (Bajaj et al., 2018), which is the starting point for debriefing in module 2.



Data feedback is generated automatically at the end of the VRS. In module 2, data is provided regarding:

After performing assessment of EWS values, the amount of time that it takes the learner to perform a follow up action is recorded. This data can give an indication of whether there were some decisions that were more difficult for the learner than others. This will be included in the subsequent debriefing.

To what extent the data collection EWS were collected systematically and that is the order in which the learner collects data. This data can be used to reflect upon the systematic approach to data collection in the debriefing phase.

In this module we have planned two types of evaluation

Firstly, a reflection workshop is held at the end of the entire module, where the facilitator together with the students evaluates the associated competence objectives. The workshop takes place immediately after the last simulation. Alternatively, this can take

place the following day, as from our experience, students can be exhausted after simulation training.

Secondly, a summative evaluation is carried out which, in addition to the learning process in Module 2, also contains other learning processes during the semester. Here there is, among other things, a focus on connections between the different learning processes in the semester as a whole.

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2.5 Module 3: Acute Stroke Nursing Care

Module leads: Yvonne Finn, Siobhan Smyth & Fionnuala Jordan

University of Galway, Ireland.

Module Description

This module focuses on acute stroke nursing care, suitable for final year general nursing students.

Content:

- Module competencies
- The educational heuristic
- VRS
- Evaluation and assessment

Module Competencies

Competencies are understood to be individual prerequisites (dispositions), which describe the ability and willingness of the learner to use knowledge and skills as well as personal, societal, and methodological abilities, and to behave in a professional manner to deliver safe person-centred care. It includes knowledge, skills, and attitudes. These competencies inform all other components of the module (Figure 7).

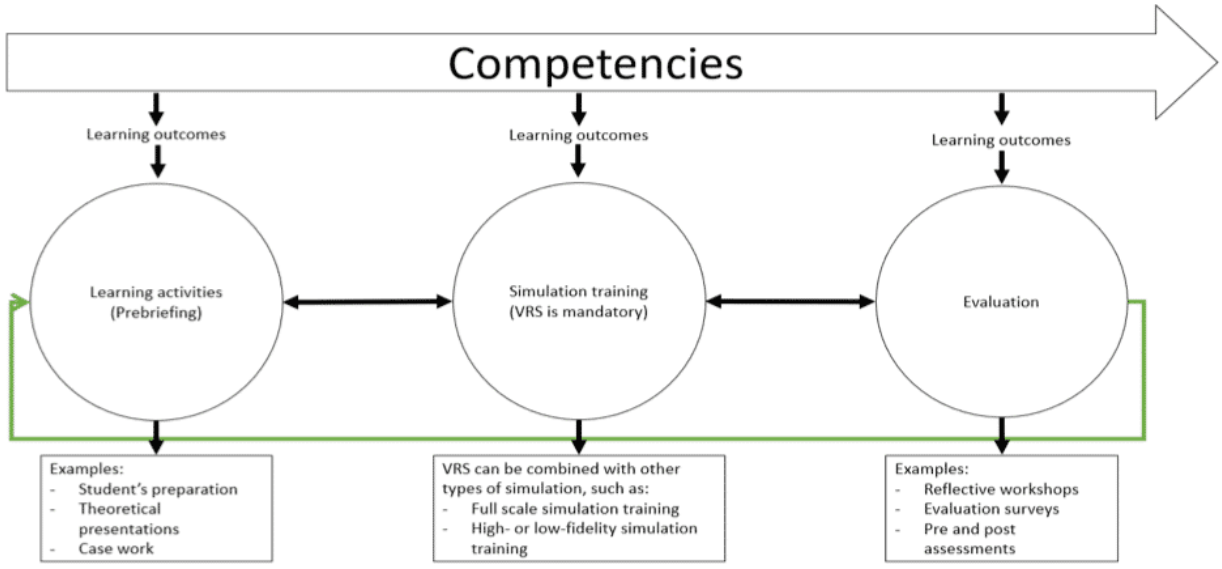


Figure 7: Module Competencies informing key module components.

The competencies are listed in Table 5.

Cognitive
Describe the risk factors, diagnosis, and patient presentation of acute stroke.
Explain the principles of nursing care for a patient with acute stroke.
Apply the principles of stroke nursing care and the multi-disciplinary team approach in the management of stroke to clinical cases.
Adhere to best practice in delivery of safe, ethical, and competent person-centered care. *
Analyze and suggest potential responses to problematic situations. *
Psychomotor:
Demonstrate the principles and practice of hand hygiene and Infection Prevention and Control (IPC).
Demonstrates safe administration, checking & management of medicines, including oxygen supplementation and intravenous fluids.
Demonstrates safe performance of oral hygiene in a patient with dysphagia (swallow difficulties).
Assist the patient to enhance their physical, sensory, and emotional well-being during person-centered care. *
Recognize and respond to situations that require to be shared with senior, more experienced colleagues or members of the multi-disciplinary team. *
Recognize and interpret signs of normal and changing healthcare needs to reach an accurate assessment of the patient's nursing needs. *
Plan nursing interventions, considering relevant observations, feedback from the person and results of nursing and clinical assessments, applying best practice evidence. *
Analyze and suggest potential responses to problematic situations. *
Apply active listening skills and respond to communicate effectively and compassionately with the person. *
Plan nursing interventions with specific outcomes for achievement of goals, applying best practice evidence and considering the acuity of a patient's health status. *
Attitudes:
Use person-centered communication strategies and demonstrate respect for a person's rights and choices. *
Support the patient through the delivery of compassionate, impartial, and non-judgmental care. *
Support the patient's safety, dignity and comfort whilst undergoing nursing interventions. *
Explore ethical dilemmas that may occur during the acute stroke VR simulation. *
Critiques practice that could compromise a person's safety, dignity, or privacy.

Table 5: Module Competencies (Based on Nursing and Midwifery Board of Ireland [NMBI], 2016)
*Denotes competencies addressed in the VRS.
Please note, nurse educators have the flexibility to add/remove competencies; this will be based
on considerations such as institutional nursing curriculum requirements, available time,
& resources.

Module Educational Heuristic

As outlined in Part 1, an educational heuristic template was created to guide the modules and VR scenario development. The educational heuristic for this module is depicted in Table 6.

	Perspective Nurse	Perspective Patient/Carers	Interest Health Care System/ Organisation
Technical knowledge Students know and explain… Scientific standards, Evidence Based Knowledge, Guidelines, Literature reviews	Scientific standards in stroke care Evidence-based knowledge of nursing care in acute stroke; examples are management of hypertension in acute stroke; monitoring, assessment, and management of	Explaining & problem solving of the patient needs: this is in respect of describing application of the nursing process, and explaining patient-centred communication skills and the principles of patient advocacy to address the needs of the patient with stroke*	Health services stroke care pathways at: National level (e.g., National stroke strategy 2020-2025; National Strategy & Policy for the Provision of Neuro rehabilitation Services in Ireland 2019 - 2021) International level (e.g., National Institute for Health and Care Excellence (2019)

	pyrexia in acute stroke*		
Practical knowledge Students realise/ understand... Experience based practice, Aspects of Caring: emotional status, individual feelings, situative and contextual differences of a specific situation(scenario), tacit knowledge)	Communication skills training Nursing care of the individual stroke patient e.g., responding to the patient needs, both physical and emotional Recognizing and understanding one's own interests, motives, and feelings	Seeking to understand the patient's perspective, motives, and values which are or could be influenced by cultural, religious, and social-economic factors. What are the perspectives of relatives, who have to care for the patients?	Understanding epidemiological, demographic, social, economic pressures on the health system
Emancipatory knowledge Students reflect on... Challenges, contradictions	Autonomy of a stroke patient versus scientific evidence and guidelines Nurse personal values in conflict with patient values	Values and beliefs of patient Impaired stroke patient communication Disclosure of the seriousness of medical condition to patient/carers	Nurse-patient ratios Inadequate leadership from senior nurses

Table 6: Educational Heuristic of Acute Stroke Nursing Care Module

Acute Stroke Nursing Care VR Scenario

The VR scenario has defined competences and learning outcomes which the learner can practice and learn through participating in the VRS. The development of the VR scenario was achieved through creation of a storyline, which was guided by the following:

1. National and European competency frameworks and standards for the education of registered nurses.
2. Focus group with an expert advisory panel to assist in identifying key competencies to be included in the VRS. The advisory panel included two lecturers with expertise in VR, an emergency department (ED) clinical skills facilitator, two final year general nursing students, a PhD student and an advanced nurse practitioner in acute stroke care.
3. Consultation with an advanced nurse practitioner (content expert) for authenticity and adherence to up-to-date guidelines and practices in the provision of nursing care to patients with acute stroke.

Figure 8: David Smith (Patient)

VR Scenario Storyline

The learner takes on the role of a newly qualified Registered Nurse (RN), Nurse Jackson, working on the acute stroke ward. The scenario **starts** in the Nurses' station, where the learner

meets Nurse Finn, the Clinical Nurse Manager (CNM) on the acute stroke ward. Nurse Finn asks the RN, Nurse Jackson, to attend to Mr. David Smith (Figure 8) as he is calling out for help.

Mr. David Smith is a 78-year-old patient who was transferred 2 hours ago from the Emergency Department (ED. He has a left-sided hemiparesis caused by an acute stroke. He is right-handed. He is under the care of Dr O'Donnell. He is confined to bed until the physiotherapist completes an assessment.

He failed a swallow screen and is awaiting swallow assessment by a speech and language therapist. Mr Smith is nil PO (nothing my mouth). He has urinary incontinence and has an incontinence pad applied. He has a history of hypertension, type 2 diabetes, and heart disease. Currently Mr. Smith is sitting in bed and is mildly drowsy.

In the ED he had investigations, including a non-contrast CT brain and a diagnosis of a right-sided acute cerebral ischemic stroke was made.

Mr. Smith's condition deteriorates as the scenario evolves. This is due to development of an aspiration pneumonia, a common complication of stroke.

The RN can take several **actions** during the VRS. These include:

Communication

- Communication with the patient. The purpose may be, for example, to seek information from the patient, to give an explanation to the patient, to empathize or provide support to the patient
- Communication with senior colleagues (Nurse Finn, Doctor Jordan). The purpose may be, for example, to report on the patient's state, seek help or update colleagues on actions taken

Assessment

- Assessment of the patient's vital signs and calculation of the EWS
- Assessment of blood glucose using POC glucometer

- Review of the patient's prescription chart

Treatment

- Change the position of the patient in the bed
- Administer a prescribed medication e.g., paracetamol, oxygen therapy
- Provide oral hygiene care
- Perform oral suctioning
- Give the patient a drink of water

There is a "**main path**" that can be followed while playing the scenario:

- The RN enters Mr David Smith's hospital room
- The RN greets the patient and asks how he is feeling
- The RN washes their hands at the sink
- The RN checks Mr. Smith's EWS
- The RN sits MR Smith up, taking care to support his left arm with pillows. Assistance to sit Mr Smith up can be requested from Nurse Finn
- The RN documents the EWS in the electronic tablet at the patient's bedside table
- The RN returns to the nurses' station and reports the EWS to the CNM, Nurse Finn
- The RN checks the prescription chart to see if Mr. Smith is prescribed PRN IV/PR paracetamol.
- Following advice from Nurse Finn, the RN administers IV paracetamol, according to the prescription chart.

The patient's condition **deteriorates** as the scenario progresses. The following provide indications that the patient's condition is deteriorating:

- Mr. Smith is coughing more and getting distressed with shortness of breath
- Mr Smith calls out and sounds more distressed e.g. "Why can you not help me Nurse?"
- The patient's EWS continues to deteriorate

- Mr Smith becomes confused towards the end of the scenario as he becomes more hypoxic and develops sepsis

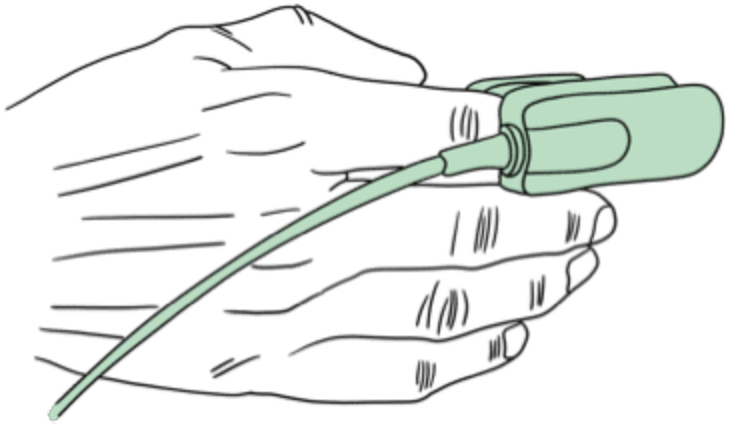
To mimic real life, there are some **interruptions** to the "main path" as the scenario progresses. The following interruptions occur:

- Mr. David Smith is thirsty and asks for a drink of water
- The duty doctor, Dr Jordan, is busy in the ED and does not immediately go to the ward to review Mr Smith.

In response to these interruptions and deterioration in the patient's condition, the RN can decide to take the following **actions:**

- Repeat EWS at intervals and report to senior staff (Nurse Finn, Dr Jordan)
- Provide oral hygiene care to Mr Smith
- Perform oral suctioning on the patient
- Administer paracetamol IV as per prescription chart (if not already administered)
- Administer 5L oxygen via a Venturi mask as direction by Dr Jordan
- Seek further advice and guidance from Nurse Finn
- Report to Dr Jordan and ask him to review Mr Smith
- Administer oxygen via a venturi mask
- Communicate with Mr Smith to explain what they think is causing his deterioration and what treatment is planned to help him improve
- Call Dr Jordan to ask him to urgently review Mr Smith
- Call the senior doctor, Dr O'Donnell, as directed by the CMN

Please note the sequence of events in the VR scenario will vary according to the decisions taken by the learner as they progress through the VRS. Similarly, the sequence of actions, will vary depending on the decisions taken by the learner



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VRS

VRS Learning Outcomes

At the end of the VRS, the learner should be able to:
1.Communicate effectively and compassionately with the patient with acute stroke to establish physical, social, and healthcare needs to guide clinical decision-making interventions in line with best practice evidence
2. Assess the clinical status in a patient with acute stroke to guide clinical reasoning and planning of nursing interventions to optimize patient outcomes and state
3. Identify the oral hygiene needs in an inpatient with acute stroke who is Nil by mouth (NPO) and provides nursing care as appropriate
4. Communicate effectively with other members of the multidisciplinary team in the delivery of care to a patient with acute stroke to guide patient interventions (ISBAR communication tool)
5. Deliver essential data to other members of the multidisciplinary team in an urgent situation in an inpatient with acute stroke to convey the need for timely assistance to effectively diagnose and treat the patient's deteriorating condition
6. Establish rapport and a professional relationship with an inpatient with acute stroke to provide compassionate, person-centered care
7. Demonstrate the ability to prioritise nursing interventions in an inpatient with acute stroke to deliver efficient and effective nursing care

8. Reflect on clinical decisions taken during the acute stroke VR simulation, providing a rationale for same, and describes impact on clinical reasoning processes that can be applied in future VR simulation and clinical practice
9. Demonstrate the constructive use of feedback on the development of self-awareness and competence as a nurse caring for an acute stroke patient

It is recommended nurse educators;

1. Are familiar with Part 2.2 which explains how to run a VRS

2. Are familiar with Part 1.4 which details health and safety considerations running a VRS

Prebriefing

This process is extensively described in section 2.2. The prebriefing includes:

- Setting the ground rules
- Establishing the fiction contract
- Setting expectations and agree confidentiality
- The VRS Duration will be 15-20 mins (approx.)
- Indicate if the nurse educator can decide to end the VRS early
- Clarify roles

Briefing

The following brief script is to introduce the learner to the VRS before they enter the scenario.

It is Monday evening, Mr. David Smith is a 78-year-old patient who was transferred 2 hours ago from the Emergency Department (ED). He has a left-sided hemiparesis

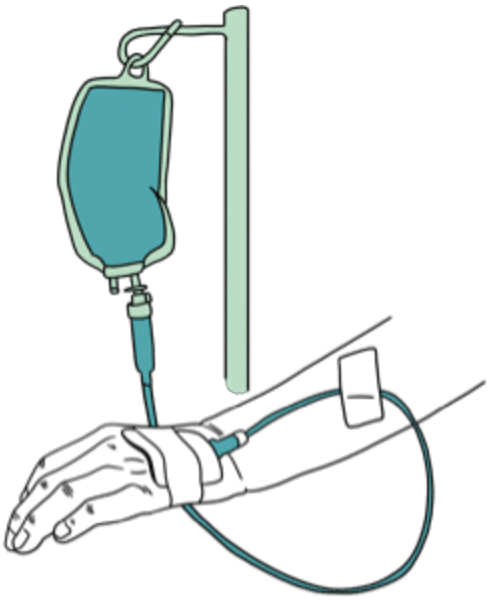
caused by an acute stroke. He is right-handed. He is under the care of Dr O'Donnell. He is confined to bed until the physiotherapist completes an assessment.

He failed a swallow screen and is awaiting swallow assessment by a speech and language therapist. Mr Smith is nil PO (nothing my mouth). He has urinary incontinence and has an incontinence pad applied. He has a history of hypertension, type 2 diabetes, and heart disease. Currently Mr. Smith is sitting in bed and is mildly drowsy.

In the ED he had investigations, including a non-contrast CT brain and a diagnosis of a right-sided acute cerebral ischemic stroke was made.

The learner takes on the role of a newly qualified Registered Nurse (RN), Nurse Jackson, working on the acute stroke ward. The scenario **starts** in the Nurses' station, where the learner meets Nurse Finn, the Clinical Nurse Manager (CNM) on the acute stroke ward. Nurse Finn asks the RN, Nurse Jackson, to attend to Mr. Smith as he is calling out for help.

The learner will enter the VRS. The nurse educator and other learners can view the VRS when casting is activated.



Debriefing

- This stage is based on the 3 D Model of Debriefing by Zigmont et al. 2011. This is also extensively described in section 2.2.

DEFUSING
Focus on emotions, feelings, situation recap, practical knowledge
	• The learner talks about their experience and the emotions felt during the scenario.
	• Encourage the learner to talk about **WHAT** happened and how they felt.
	• The learner can be encouraged to talk by asking the following questions:
	  ○ "How did it feel to be part of the scenario?"
	  ○ "How did you feel during the scenario?"
	  ○ "How do you feel now?"
	• If the learner starts to reason their actions, the nurse educator should bring the focus back to what happened and how that made them feel, e.g., the educator could say:
	  ○ "Let's recap WHAT happened during that scenario so that we can then discuss WHY during the second part of the debriefing"

DISCOVERING
Identify mental model
Analyse the situation and happenings
Focus on practical and technical knowledge
	• Lead over to talk about the reasons WHY something was done.
	• If the learner needs some guidance, you can use the following sentences:
	  ○ "Thanks for sharing the rationale. Has anyone else every experienced this? What did you do to deal with that situation and why?"
	  ○ "How might this situation have been different if you had used that strategy?"
	  ○ "I noticed that you did x in the y situation. I was curious about that action because... (Nurse Educator offers his own mental model about how to deal with y). ¿Can you tell me why you did x?"
	  ○ "Another way to handle x is z (target mental model). If you had done z, how would that change y?"

1. DEEPENING
Transfer of learning to clinical practice
 	
Identify contradictions
 	
Acquire emancipatory knowledge
	• Find a connection to the clinical practice and future situations.
	• The following sentences may be helpful:
	  ◦ "If you were to encounter a similar situation in the future, how would you handle it?"
	  ◦ "How can you use the information we just discussed in your clinical practice?"
	  ◦ "Can you think of other situations where this information could be applied?"
	  ◦ "Did you experience any inner conflicts?"

2. DEEPENING Possible topics for a discussion	• Technical knowledge, e.g., stroke guidelines and acute stroke care • Not responding to requests from CNM – Nurse Finn • Technical possibilities vs. anticipated real actions • Teamwork and communication • IPC and hygiene
3. DEEPENING Possible reflection on emancipatory knowledge	• Challenges, e.g., lack of experience as a RN • Contradictions, e.g., patient wishes vs. standards of nursing care in acute stroke • Ethical considerations, e.g., deteriorating patient vs. busy duty doctor in ED
SUMMARY	• Ask the learners: "How do you feel now?" • Highlight the key lessons learned; link to the learning outcome • Take more message: " What is one thing that you can take away from this VRS to use in your practice going forward?"

Automated feedback is recorded as follows:

- Performance of hand hygiene at appropriate moments e.g. before checking EWS.
- Time taken to seek senior help after patient's condition deteriorates

The information provided in the automated feedback can facilitate discussion and learning in the debriefing.

Evaluation

Evaluation of the VRS can address learner satisfaction, presentation, delivery, support from the nurse educator and other faculty. Several instruments are available across different categories of evaluation of simulation. The SUS (system usability scale) is reported in the literature in evaluating the usability of VRS (Brooke, 1996).

A repository of these instruments can be found by clicking on the INACSL website. Student satisfaction with simulation can be measured, for example, with the Student Perception of Effective Teaching in Simulation Scale and Educational Satisfaction Scale. Debriefing can be evaluated using the Debriefing Assessment for Simulation in Healthcare (DASH).

Assessment

Formative assessment takes place during the debriefing phase of the VRS. Formative assessment "works best when it is (1) embedded in the instructional process and/or clinical workflow (2) provides specific and actionable feedback (3) is ongoing and (4) is timely." (Norcini et al. 2018, p.1103). The debriefing process in the VRS is aligned to these criteria, providing a powerful tool for feedback and formative learning.

Summative assessments include written and practice assessments, to test acquisition of module competencies. For example, single best answer questions (SBAs) can be designed to test application of knowledge in the provision of nursing care in clinical practice. This can be done using a clinical vignette. The NBME item writing Guide provides a step-by-step guide on writing SBAs for the clinical sciences. Performance-based assessments, such as Objective

Structured Clinical Examination (OSCE), can be designed to assess students' competency in the VRS learning outcomes.

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