The Proposal of an Instructional Design Modelformaternity Nursing in Japan-Simulation-based Education for Improving Clinical Judgement

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Abstract

Clinical judgement is a prerequisite for nurses for extending efficient health care based on their education, knowledge, reasoning, intuitive thinking and experience. Nurses involved in maternity nursingprovide care toexpectant and new mothers before, during and after child birth.Therefore, effective nursing education plays a very important role in increasing the nurses'professional competencies and improving the quality of care provided by them. However, the spread of COVID-19 in Japan and the changing social conditions surrounding perinatal care have made it necessary to introduce simulation education to improve clinical judgement skills. In this paper, we propose an instructional design for effective simulation education for maternity nursing as an alternative to practical training in a clinical setting. The design was developed based onMerrill'sfive principles of instruction.The high-fidelity simulation task was constructed according tothecognitive load theory, controlling for three different loads.We referred to Tanner's clinical judgementmodel and discussed relevant references on 'intuition' or 'tacit knowledge' as a component of clinical reasoning patterns.We also discussed the importance of 'intuition' and debriefing on experiencesas per the Dreyfus model.Relevant papers were reviewed and scales developed to assess simulation-based education.

***Keywords**, Clinicaltraining, nursing education, COVID-19, clinical reasoning,perinatal care*

Introduction

In Japan, the nursing students are required to practice post-partumand neonatal nursing care as mandatory components ofbasic education for the national qualification.[1] The Ministry of Health, Labour and Welfare (MHLW)'s national-level nursingexamination includes questions related toperinatal nursing care. Thus, not only the midwifery students but also the nursing studentsin clinics or hospitalslearn how tocare for pregnant/post-partum women and newborns to provide proper care/ support. However, due to the coronavirus disease 2019(COVID-19) pandemic, the clinical trainingfor perinatal nursing in the hospital settingin 2020 has been cancelled due tothe riskofspreading COVID-19 infection from nursing students to pregnant/post-partumwomen, babies and health care providers in hospitals.Due to the prevailing social situation, as clinical supervisors, the nurses are struggling to cope

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with caring for the patients and it is difficult to provide the nursing studentswith sufficient instructionsin the medical setting now. Thishasinevitably led to the consideration of introducing simulation-based nursing educationinstead of clinic- or hospital-based training for imparting maternity nursing knowledge and skills. TheMinistry of Education, Culture, Sports, Science and Technology (MEXT) has requested for allocation of5 billionin the budget for 2021for the enrichment of simulation-based education in medical institutions[2], which would reduce theburden on theseinstitutions.In particular, high-fidelity simulations involving the use of sophisticated full-body mannequinsare expected to be incorporated in nursing education as they enable students to acquire practical skills without imposing any burden on thepatients.[3, 4, 5] Nonetheless, there is inherent difficulty in the implementation of and increasing the demand for simulation-based education in clinical practice for perinatal care in Japan.

Afterthe second baby boom in 1971–1974 in Japan, there was a steady decline in the birth ratedue to the economic turmoil caused by the first oil shock and the spread of the idea of a static population in response to the worldwide population growth trend.[6] Consequently, there was a drastic reduction in thenumber of mothers and babies to care for by the nursing students, which in turn decreased the opportunities to learn perinatal nursingin clinical practice. As a result, basic nursing education has not been able to equip the nurses with the required competencies in perinatal care.Therefore,it has become necessary to compensate, through other methods,for what cannot be learned clinically.Moreover, the growingnumber of high-risk pregnantwomen due to the increasein the average age of first-timemothersinJapan has added to the challenges in the perinatal care. For instance, advanced-age motherhood is associated with a higher risk of diabetes.[7] Consequently, the nurses and midwives who are engagedin perinatal care are increasinglyrequired to learn and developparticular skills tobe able toidentify non-normal pregnancies and post-partumissuesto formulate the appropriatemedical treatment.Also, there is a growing appreciation for improved clinical judgement in this domain of health care and the significanceof simulation-based education in fostering this ability.[8] Therefore, here, we will explore the pedagogy forsimulation-based education as the instructional model for training nursing students in perinatal care to enhance their clinical judgement skills to empower them as professional health care providers. It needs to premise on the provision of safeand high-quality medical care to patients to avoidthe risk of lawsuits due tomedical accidents. As medical accidents were criminalised and medical providers arrested in some cases since 2000, the safety and quality of medical treatment have become the top priority in Japan.[9] Therefore, training nurses in these aspects is the most significant task in the nursing pedagogical curricula.[10]

The purpose of this paper is topropose an instructional design forsimulation-based educationfor maternity nursingto improve clinical judgement skills as an alternative to training in the clinical setting. The relevant literature on this subject will be reviewed to clarify the major elements.

Review of Literature and Proposal for Instructional Design

Introduction of simulation-based education

The demand for simulation-basednursing and midwifery education in the clinical setting has increased worldwide to compensate for increased demands on the training hours. This form of training is also widely recommended to ensure patient safety and quality of care and to develop clinical judgement.[8, 11, 12, 13] This hasgiven rise to a new paradigm of education in health care.

As thefirst step in developing a simulation-based instructional design, it is important to adapt it to the level of the student.[11] Sweller[14] mentioned cognitive load theory as a key element inthis endeavour. Itis based oncontrolling three types of load: intrinsic;

extraneous; and germane loads, which enable students to learn in a way that is suitable for them. The intrinsic load is increasedif a less proficient learner is assigned a task with a high level of difficulty.Poor design of instructional materials results in a high extraneousload asthelearners are confused by the interpretation of information that is not directly relevant to the task. Germanic load refers to the mental resources devoted to the acquisition and automatisation of schemas in long-term memory. Avoiding overloading, i.e. not exposing students to an excessive amount of information at one time, while at the same time placing a suitable load on working memory, will enhance learning.We created a simulation task in which these three loads were appropriately controlledand also determined its cognitive load by interviewing individual students after the simulation (Table 1).

Table1The rating scale for the cognitive load level

Controlled cognitive load	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Intrinsic load	1.Utilised knowledge that I already knew	5	4	3	2	1
Extraneous load	2.The presented simulation scenario simulates exactly	5	4	3	2	1
	3. The simulation scenario was completely immersive	5	4	3	2	1
Germane load	4.Case study could be applied	5	4	3	2	1
	5. Learning outcomes could be reflected on effectively	5	4	3	2	1

The instructional design of simulation-based education for maternity nursing

All the recommended instructionsfor simulation-basedmaternity nursing education were based on the principles of instructional design. They included a wide range of activities such as teaching, selection of the instructional materials, monitoring of time progression and teaching activitiesthat enhance learning.[17]When designing the instructions, the focus wason supporting the learning process and designing the learning plan in a student-centredmodel. Merrill'sfive first principles of instruction[18] state that:*(a) Learning is promoted when learners are engaged in solving real-world problems. (b) Learning is promoted when existing knowledge is activated as a foundation for new knowledge. (c) Learning is promoted when new knowledge is demonstrated to the learner. (d) Learning is promoted when new knowledge is applied by the learner. (e) Learning is promoted when new knowledge is integrated into the learner's world.*

We referred to Merrill's five first principles of instruction for developing the maternity nursing education programme's instructional design (Table2).

These principles are based on the following 5 components: task/problem-centred instruction, activation, demonstration, application and integration.

Table 2: The instructional design based on Merrill's 5 first principles for maternity nursing

Merrill's five first principles of instruction	Timetable	Our instruction
1. Task: Challenge students with real-world tasks.		To prepare a task the situation for nursing practice of a mother and child in the post-partum period during hospitalisation. Use an unfolding case study (It includes information from pregnancy through to the post-natal period in hospital).
2. Activation: Encourage students to use the knowledge they already have.	The first 27 hours of the 90-hour programme.	Remind the students of the knowledge and skills needed to assess the progress and adjustment of the mother and child on a post-partum day. A written exam to test knowledge.
3. Demonstration: Show the characteristic skills to students.		In observing the post-partum mothers and newborns, characteristic skills that have not been mastered in previous nursing skills will be demonstrated (observation of contraction and height of the uterine and new-born health examination).
4. Application: Opportunities for Application.	The first 36 hours of the 90-hour programme	Take an unfolding case study* (e.g. from the first to the fourth day after childbirth) and simulate nursing practice with a simulated patient. Debriefing after each simulation
5. Integration: Apply the new skills acquired.	The first 27 hours of the 90-hour programme.	Objective Structured Clinical Examination (OSCE) to confirm that the skills have been acquired.

Written exams were conducted after completion of all relevant lecturesto test the knowledge of clinical skills gained by the students as perMiller's guidelines.[19]An objective structured clinical examination (OSCE)was usedto assess whether the students had integrated their knowledge and skills and would be able to practice them in real-life situations on mothers and babies.

In instructional design, it is essential to motivate the learners. Keller[20] presented four domains related to motivation to learn: (1)'attention', which involvesstimulatingand sustainingthe learner's curiosity and interest; (2)'relevance'–to make the learner believe that the learning experience

would be personally meaningful; (3)'confidence'–the appropriate expectation of success rather than overconfidence or lack of confidence and (4)'satisfaction'–whether the learner would be satisfied with the process and outcome of the learning experiences.Then, the attention, relevance, confidence, satisfaction and volition (ARCS-V) model was developed[21]to assess the motivation among the students for the task of theinstructional design (Tables3).

At the end of the study,the students were asked to evaluate how well the simulation-based education model motivated them to acquire the maternity nursing competencies.

Table3: The rating scale for the students' motivation for the simulation task

ARCS-V	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Attention	1. It was interesting.	5	4	3	2	1
Relevance	2. It was worthwhile.	5	4	3	2	1
Confidence	3. I could do it.	5	4	3	2	1
Satisfaction	5. It was satisfying.	5	4	3	2	1
Volition	4. I could finish it.	5	4	3	2	1

How can the competenciesof clinical judgement be improved by simulation-based education?

Clinical judgement

In USA,the data indicatedthat only 23% ofthenewly graduated nurses demonstrate entry-level competencies and practice readiness despite havingpassed the national exam for nurses.[22]Considering that this situation has been going on for a long time, it is necessary to fundamentally revise the basic nursing education model. The primary goals of nursing education havebeen forced to change to predominantlydeveloping practical skillssuch as clinical judgement as opposed to the conventional,theory-based education model.At present, our educational programmehas alsobeen focussing on this aspect.

Although the nursing students in Japanare familiar withthe term 'clinical judgement',the extent of their understanding of the concept is unclear.Rubin[23] describes'clinical judgement' in a book 'Expertise in Nursing Practice'as follows:*'We use the term clinical judgement to refer to the way in which nurses come to understand the problems, issues or concerns of clients and patients, to attend salient information and to respond in concerned and involved ways'* (p.200). Also, Tanner[24]describes it asfollows:*'the term "clinical judgement" to mean an interpretation or conclusion about a patient's needs, concerns or health problems and/or the decision to take action (or not), use or modify standard approaches or improvise new ones as deemed appropriate by the patient's response'*.To summarise, clinical judgementcanbedevelopedthroughout the nursing

process duringwhich the nurses assess a situation by using observation skills and acts based on the clinical informationand medical examinationsofthe patients.Consequently, they can analysethe right approachfor nursing practices and consider whether to continue or revise the nursing intervention based on the results.The term 'clinical reasoning' is often confused with 'clinical judgement' in Japan. Clinical reasoning refers to the processof judgement by health providers.[24]Generally, it involves the process ofidentifying a diagnosis and planning anintervention in clinical situations by medical doctors and nurses. The pattern of clinical reasoning may vary depending on the person's level of experience, for example,it widely differs between novices and experts. Clinical reasoning might be the key to interpreting what we notice (or based on the gathered information) in our clinical judgement.

The following sections will discuss the elements that constitute clinical judgement and those that specifically require strengthening in order to become an expert.

The core of clinical judgement model-Intuition is stored as one's knowledge-

Tanner[24] presented the 'clinical judgement model'that includes four phases:'noticing', 'interpreting','responding' and 'reflecting' based on what the nurses notice and how they interpret their observations, respond to the situation and reflect on those responses.This clinical judgement model was constructed based on interviews with expert nurses and their thinking process during decision making in nursing care. An experience becomes transferable through 'reflection'. Tanner used the term 'reflection' to describe the process of reflecting on an action.In simulation-based education, the reflection process is commonly described as 'debriefing',which is recognised as having an important role in this model for the immobilisation of the content and the clinical adaptation of the simulation. 'Reflection' and 'discussion' encourage participants to think autonomously and change their future behaviour.

In the Dreyfus model[25], which is based on the recognition that experiential learning is essential, includes several levels based on the amount of experience such asnovice, advanced beginner, competent, proficient and finally,expert. It is possible for novices to get closer to the expert level by learning how anexpert think. 'interpreting' includes three reasoning patterns: 'analytic', 'intuitive' and 'narrative'.'Intuition'is developedas one progresses through each level (from novice to expert)and is similarto the term 'tacit knowing'. According to Polanyi[26],during the skills developmentprocess, the focus of attention shifts as the things that initially required awareness are eventually captured by the mind unconsciously. To be able to ride a bicycle or play the piano, explicit knowledge needs to be changed to tacit knowledge.Rubin[23]emphasised on theimportanceof intuition in clinical judgements and stated that'intuition is characterisedby immediate apprehension of a clinical situation and is a function of acquaintance with similar experiences'.An intuitive competency means that a nurse has conceptualisedthe events they have experienced before in a clinical setting and are able to organisethem into common patterns of cues that can be applied to other similar situations and accessed in a drawing out of their brain without making a conscious effort.

Experiential learning and the significance of debriefing

The simulation-based education model was formulated based on Kolb's experiential learning theory[27],which consists of four modes: 'active experimentation' by 'abstract conceptualisation'through 'reflective observation'of 'concrete experience'. Dewey[28] suggested that experiential learning is most productive in environments where performance feedback is rich and opportunities to articulate and reflect on experiential

learning are deliberately planned. Schon[29], who conducted a study of the structure of reflection, underlines the significance of reflecting on experiences that encourageus to approach unanticipated outcomes as new knowledge. Solid experience and effective reflection are important in experiential learning. Simulation of actual clinical situations may enable students to accumulate intuitive competencies by reflecting on their experiences. Therefore, effective debriefing is as crucial as the preparation of high-fidelity simulation scenarios.

Furthermore, effective debriefing could contribute to a deeper conceptualisation of the experienced events. Accumulating experiences is not enough forbecoming an expert.It is vital to apply thoseexperiences to the next similar situation.Generalisation can be definedas remembering the common concepts amongthe many individual occurrences and applying them to others. Lasater& Nielsen[30] believe that concept-based learning for students could contribute to the improvement of their clinical judgement. However, it is extremely challenging to conceptualise intangible things.[31]The process of conceptualisation requires reflection oneventsand passing on the knowledge tonewstudents, instructing themtosimilarlyreflect on their ownsuccessfulor unsuccessful experiencesand use themto improve their clinical judgement skills. Lasater[32] proposed a rubric for assessing clinical judgement skills, whichconsists of a four-level assessment scale of achievement for each of the four elements of Tanner's clinical judgement model. However, the evaluation indicators are abstract and it is difficult to assess how to apply them to specific situations. In developingthe maternity nursing simulation, we chose not to adopt Lasater's rubric, which measures the improvement in clinical judgement directly. Considering that the habit of looking back after simulation will eventually lead to improved clinical judgement, we triedto examine effective methods of debriefing. Moreover,our goal was tobe able to assess the post-partum progress of the mother and new-born baby and to perform basic skills required in maternity nursing without assessing clinical judgement itself through simulation and determinewhether these goals couldbe achieved through OSCE.

The debriefing process enables students to effectively acquire knowledge derived from experiences. There are a number of studies on the debriefing methods,theirimportance and waysto facilitate them.[33, 34, 35]

The gather, analyse and summarise (GAS) method is one of the most commonly used in debriefing. The 'gather' phase involves collection of tips to look back on the actions performed in the simulation; 'analyse' looks back at the action tip as to why it was successfully completed and whether there is further improvement and 'summarise' discusses how to apply these results next time. In this study, we decided to compare the GAS and after action review (AAR) methodsto examine whichof these debriefing methods is more effective for novices. The US army has adopted AAR as the primary method for providing feedback after simulation battle exercises.[35,36] The AAR is composed of a series of questionssuch as 'What happened during the collective training exercise?'; 'Why did it happen?'; 'How can units improve their performance?' etc.We have developed further questions to specifically discuss the 'Why did it happen?' of the AAR method. It is a way of focussing on identifying the gaps between what you have achieved and what you were aiming for and what knowledge and skills you have acquired that are not working when you practice the simulation tasks and then considering the implications of these gaps and how to address them. We presented the AAR method to the students (Table 4).

Table4 : Debriefing steps for the AAR method (Group Discussion)

First step	They discuss for identify the best practices in the context of goals.
Second step	After watching the simulation video, they discuss identifying the successful practices.
Third step	After watching the simulation video, they discuss identifying the practices that have not done sufficiently well.
Forth step	They compare what they successfully and unsuccessfully did, they extracted the gaps.
Five step	Thinking about why gaps were emerging, think about what they can do to compensate for what they could not do and reflect on their next steps.

Conclusion

In Japan, the spread of COVID-19 and the changing social conditions surrounding perinatal care have made it necessary to introduce simulation-based education.In this paper, we proposedan instructional design for effective simulation-based education for maternity nursing to improve clinical judgement as an alternative to practical training in a clinical setting.The instructionaldesign and simulation scenarios were set up using the theoretical background. We also reviewed and discussed the literature on intuition and tacit knowledge as the key elements of clinical judgement that students need to acquire. We developed scales to assess the appropriateness of the simulation training presented to the students and whether the students' motivation to study could be maintained.

Maternity nursing simulations wereconducted in placeof a clinical setting.After the simulation, the students were asked to provide answers toall the scales presented in this paper. The data collection is in progress and thestudents' evaluationswill be analysedand reported in a further study.

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