Using the Roy adaptation model to guide the health assessment of patients in an intensive care setting in Hong Kong

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SUMMARY

- The Roy adaptation model is a logical and systematic nursing theory which identifies the recipient of nursing care as a bio-psycho-social adaptive system.
- The model provides a unique conceptual framework to help guide nurses in assessment, problem identification, goal setting, planning, implementation and evaluation of care in nursing practice.
- In intensive care units, the application of the model may help guide nurses in the identification of patient problems and in the prioritisation of care.
- This case study describes how the author used the framework of the Roy adaptation model to assess an intensive care patient's health status during the severe acute respiratory syndrome epidemic in 2003.

INTRODUCTION

In order to meet the multi-dimensional needs of critically ill patients in intensive care units (ICUs), it is important to use a holistic approach to care delivery. The nursing process provides a logical, step-by-step guide for the delivery of care and the incorporation of nursing models can provide justification and rationale to support the action taken. Conceptual models of nursing are frames of reference for clinical practice. They provide distinctive guidelines for delivering optimal care to meet the needs of patients/clients. This article presents a case study that describes the use of the Roy adaptation model (RAM) for a patient with severe acute respiratory syndrome (SARS) in an ICU in Hong Kong during the SARS outbreak in 2003.

DESCRIPTION OF THE ROY ADAPTATION MODEL (RAM)

The RAM is a nursing model based on both the concept of adaptation by Nelson and systems theory by Von Bertalanffy (Roy & Andrews, 1999). Five major concepts of nursing are examined in this model: the person, the environment, health, the goal of nursing, and nursing activities.

The person

The person is described as a bio-psycho-social being or system in constant interaction with a changing environment and as having four modes of adaptation (see Table 1): physiological function, self-concept, role function and interdependence. If the environment (or stimulus) has an effect on the person, the person's integrity will be disturbed and health problems may occur. To protect against this, the person has two types of coping mechanisms to help with restoring health: regulator (physiological adjustment) and cognator (cognitive-emotive adjustment). Additionally, a person is described as having a zone of adaptation. Stimuli (or changes) that fall within this zone will result in a positive adaptation (good health) and stimuli that fall outside this zone will result in maladaptation (ill health).

Mode	Description
Physiological mode	Refers to how the person's physical function responds to the stimuli. It includes five physiological needs (oxygenation, nutrition, elimination, protection, activity and rest) and four complex processes (senses, fluid and electrolytes, neurological function, and endocrine function).
Self-concept mode	Refers to the person's psychological response to the stimuli. It includes physical self and personal self. The physical self incorporates body sensation and body image. The personal self incorporates self-consistency, self-ideal and oral-ethical-spiritual self.
Role function mode	Refers to the person's social role function, which can be classified as primary role (e.g. male, female), secondary role (e.g. father, mother, teacher) and tertiary role (e.g. volunteer worker for a charity association).
Interdependence mode	Refers to the person's emotional or affectionate adequacy. It involves the giving and receiving of love, respect and value.

Table 1: The RAM's four modes of adaptation.

The environment

The environment refers to the stimulating factors within the person (internal stimuli, e.g. endocrine disorders) and outside the person (external stimuli, e.g. bacterial infection, trauma). Stimuli from the environment may affect the integrity of the person and may alter the person's health status.

Health

Health is a state of successful positive adaptation to stimuli from the environment. These stimuli interfere with basic need satisfaction and so threaten to disrupt the system's equilibrium. Health is described as a state where the person can adapt to changes in environmental stimuli, whereas ill health is a state where the person cannot adapt or shows maladaptive behaviour.

The goal of nursing

The overall goal of nursing is to help the person achieve positive adaptation in each of the four adaptive modes. Positive adaptation in physiological mode can refer to a condition whereby the patient's physiological parameters are affected but the patient's vital functions are maintained. For example, despite a drop in blood pressure, the patient can maintain adequate oxygenation and body warmth. Positive adaptation in psychosocial mode can refer to a condition where the patient faces a lot of stressors but remains calm and in control.

Nursing activities

Nursing activities refer to how nursing care is delivered in a systematic manner. There are six steps in this process:

- First level assessment;
- Second level assessment;
- Problem identification;
- Goal setting;
- Intervention;
- Evaluation.

First level assessment helps to identify if the person has developed any maladaptive behaviour or ill health relating to the four adaptive modes (e.g. hypoxaemia, anxiety).

Second level assessment helps to identify the stimuli that are contributing to the maladaptive behaviour (e.g. hypoxaemia due to severe pneumonia, anxiety due to fear of death). Nurses need to identify whether the identified maladaptive behaviour is related to focal stimuli (direct causes), contextual stimuli (related causes), or residual stimuli (causes related to belief, attitudes and experiences).

Problem identification (or nursing diagnosis) helps to identify the patient's problem in relation to the four adaptive modes. The patient's problem can be labelled using the North America Nursing Diagnosis Association (NANDA) (e.g. decreased cardiac output) (Roy & Andrews, 1999), Roy's typology (Roy's classification of patient problem, e.g. shock) (Roy & Andrews, 1999), or by simply stating the patient's problem (e.g. shock).

Goal setting requires nurses to identify goals that lead to a change in maladaptive behaviour, reinforce adaptive behaviour, and/or enhance the person's coping abilities.

Intervention describes the actions required to manipulate the focal stimuli to enable a positive adaptive response, or to widen the zone of adaptation (so that the stimuli fall within the person's ability to adapt positively). Finally, evaluation enables an assessment of the person's responses to interventions and subsequent behaviours.

THE ROY ADAPTATON MODEL IN ICU

The RAM has been used in the ICU at Prince of Wales Hospital, Hong Kong, for many years. The literature indicates that the model has been applied in various clinical settings including ICUs (Giger et al., 1987). McKenna (1997) notes that it is important to select a nursing model that matches the type of patient/client and the nature of the healthcare setting. With the RAM, every adaptive mode is subdivided into detailed components that are clearly defined for assessment. The physiological mode of the RAM provides a comprehensive systematic guide based on what nurses can actually identify in terms of physiological function. This matches the characteristics of ICUs where most patients have severe physiological dysfunctions that require detailed physical assessment. However, the RAM not only focuses on the patient's physiological function but also guides nurses to look into the psychosocial aspects of the patient's health so that psychosocial care is not neglected in a technologically overwhelming unit. The use of this model serves to provide and promote a balance between physiological and psychological functioning and health.

As an overview, the RAM is based on the concept of adaptation and system theory. When the environment or stimulus (e.g. coronavirus) affects the integrity of the system (or person), health problems (e.g. SARS) occur. Patients will present with maladaptation in their physiological functioning (hypoxaemia) as well as in their psychosocial aspect (anxiety). The goal of nursing is to intervene to help the person achieve positive adaptation(s), e.g. improving arterial oxygen saturation by manipulating focal stimuli, such as the administration of a specific treatment (Ribavirin and steroids), administrating oxygen therapy, and widening the zone of adaptation by putting the patient on complete bed rest and offering assistance in performing activities to reduce oxygen consumption.

This theoretical framework matches the goal of nursing in ICUs as recommended by the College of Nursing, Hong Kong (2000), which states that intensive care nursing should promote optimal adaptation of critically ill patients and their families in the ICU by providing highly individualised care so that critically ill patients adapt to their physiological dysfunction as well as the psychological stress of being in ICU. By using the RAM, nurses can identify patient problems and prioritise care more effectively.

SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

SARS was identified and defined by the World Health Organisation (WHO, 2003) and the Centre for Disease Control and Prevention (CDC, 2004) after the first outbreak in Guangdong Province (China) in November 2002. SARS was first identified in Hong Kong in early March 2003. From March to June 2003, 1,755 people contracted the infection and many of them were healthcare workers. 299 people died (17% of the total). An estimated 20% of patients developed acute respiratory failure, requiring admission to ICU for management (Lee et al., 2003).

SARS is a highly infectious disease. It mainly affects the patient's respiratory system resulting in severe hypoxaemia. Thus, the focus of care was on controlling the spread of infection and providing adequate cardio-respiratory support to improve the patient's oxygenation status.

CASE STUDY

Mr C, a 50-year-old man, was the husband of a patient who was treated on a medical ward as a result of a chest infection. Following a visit to his wife, Mr C developed a fever, chills, rigors, myalgia and mild dyspnoea. He attended the accident and emergency department and a chest X-ray revealed bilateral basal infiltration. He was suspected of having contracted SARS and was admitted to the medical ward for management.

On the medical ward he was given oxygen via a face mask to relieve his dyspnoea and hypoxaemia. Investigation showed he had a coronavirus antibody titre of 40 (normal values <40) in his serum blood, and his sputum for Reverse Transcriptase - Polymerase Chain Reaction (RT-PCR) showed a positive response, indicating SARS. These findings confirmed that Mr C had contracted the SARS infection. Ribavirin and high dose methylprednisolone were commenced. After a week, Mr C developed tachypnoea and oxygen desaturation despite an increase in oxygen administration. The intensivist was then consulted and Mr C was diagnosed with acute respiratory failure. He was intubated and transferred to ICU for full ventilation and further management.

On arrival at the ICU, a nursing assessment based on the RAM was carried out (Table 2). The first level assessment allowed nurses to identify the problems in Mr C's four adaptation modes. The second level assessment allowed nurses to identify the stimuli (factors) contributing to the problems.

After performing the nursing assessment, ten patient problems were identified. These included: hypoxaemia; bradycardia; electrolyte imbalance; diarrhoea; SARS infection; muscle weakness; exercise intolerance; hyperglycaemia; worry and depression. Based on the findings of this nursing assessment, a nursing care plan was developed.

The health assessment (Table 2) was performed on the first day of ICU admission. The 1st level health assessment helped nurses identify Mr C's physiological as well as psychosocial problems through the four adaptation modes. The 2nd level assessment (identification of focal, contextual and residual stimuli) helped nurses differentiate between the different factors that contributed to Mr C's problems.

Health assessment should not be a one-off practice. Nurses performed health assessments of Mr C at regular intervals (every shift) and whenever Mr C's condition changed. These health assessments allowed nurses to have a better understanding of Mr C's needs and progress.

Mr C stayed in the ICU for approximately three weeks. During his stay he received mechanical ventilation and on one occasion was ventilated in the prone position. He continued to receive Ribavirin and methylprednisolone, and other treatments included Immunoglobulin M and convalescent anti-serum. Mr C responded to these treatments and was weaned off the ventilator after 14 days. He remained in ICU for a further week and was then transferred to a medical ward for subsequent management and care.

PROS AND CONS OF THE ROY ADAPTATION MODEL

Some limitations have been identified in the application of the RAM:

- ❖ It contains many abstract terms or jargon (e.g. stimuli), which can make the model difficult to fully understand;
- ❖ Some of the concepts overlap (e.g. focal stimuli, contextual stimuli and residual stimuli);
- ❖ The comprehensive nature of the RAM means it can be time consuming to complete;
- ❖ The rapid changes in Mr C's condition in ICU sometimes made the implementation of the model difficult.

These issues and limitations have been identified previously by other authors (Pioli & Sandor, 1989; Akinsanya et al., 1994; Tiedeman, 1996). Despite the identification of these limitations, the model has clear strengths. The physiological mode provides a systematic guide through which nurses could comprehensively identify the patient's physiological function, and this became especially important because Mr C had severe physiological dysfunction (e.g. respiratory failure). The RAM also guided nurses to look into Mr C's psychosocial aspects (such as self concept, role function and interdependence) so that his psychosocial needs were not neglected in a technologically overwhelming unit. By doing so, nurses learnt how to treat Mr C as an integrated whole.

With its two-level assessment, nurses were able to identify Mr C's physical, psychological and social problems more easily and more specifically. Also, because the RAM allowed flexibility in labelling the identified patient problems (by just stating the particular problems), it helped nurses to adapt this model more easily, and allowed different healthcare professionals to communicate more easily.

CONCLUSION

The ability to perform comprehensive health assessments to identify the problems of patients/clients is an important characteristic of advanced nursing practice. Using a nursing model as a framework to guide practice in ICU will enable nurses to understand their patients' needs and provide nurses with a clearer direction for delivering patient care.

Footnote

As a result of the SARS outbreak in Hong Kong and the subsequent demands for ICU beds, many volunteer nurses with little or no ICU experience were recruited to work in the unit. In response to this, the Institute of Advanced Nursing Studies of the Hospital Authority developed a short training programme for these nurses. The author was invited by the Institute to help design the programme and a one-week course was developed. The course content included understanding SARS, principles of infection control and cardio-respiratory care. The author incorporated the RAM framework as a tool to guide the nurses' education and practice.

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Physiological Mode of Adaptation	1st Level Assessment	2nd Level Assessment
Physiological mode Oxygenation	❖ Mr C is put on a ventilator with PCV mode and FiO2 1.0. ❖ Pulse oximeter shows SpO2 at 87%. ❖ ECG monitor shows bradycardia, but the blood pressure is normal. ❖ Mr C's haemoglobin is low (7.9g/dL), with an increase in reticulocyte count and haptoglobin level.	❖ Hypoxaemia is caused by SARS (F). ❖ Hypoxaemia is related to his history of COAD (C). ❖ Bradycardia is caused by the side effect of Ribavirin (F). ❖ Bradycardia can be related to hypoxaemia (C). ❖ Haemolytic anaemia is caused by Ribavirin.
Neurological function	❖ Low dose morphine and midazolam infusion are commenced, but Mr C is still awake.	❖ No significant problem identified.
Fluid & electrolytes	❖ Fluid balance is normal. Serum potassium is low (3.4mmol/l), and serum sodium is high (148mmol/l).	❖ Low potassium and high sodium are caused by the administration of a high dose of steroid (F).
Nutrition	❖ Mr C cannot eat food orally. Nasogastric feeding is commenced.	❖ No significant problem identified.
Elimination	❖ An urethral catheter is inserted with normal amount of urine output. Mr C develops diarrhoea – three times since admission.	❖ Diarrhoea is caused by SARS (F). ❖ Diarrhoea can be a side effect of Ribavirin C).
Sense * Communication * Pain	❖ After intubation, Mr C cannot talk, but he can use pen and paper to communicate his needs. ❖ Mr C does not express any pain.	❖ No significant problem identified.
Protection * Skin integrity * Immune function	❖ Mr C's skin is intact with no pressure sores. ❖ Mr C has fever (> 38^{O}C) with an increase in WCC and CRP. Coronavirus antibody titre and RT-PCR show that he is infected by the SARS virus.	❖ Infection is caused by the SARS virus (F). ❖ Risk of superimposed infection due to the use of high dose steroid (C).
Exercise and rest	❖ Muscle weakness is noted. ❖ Mr C's exercise tolerance is bad, with a further drop of oxygen saturation on mild activity (e.g. during bowel opening).	❖ Muscle weakness (myopathy) is caused by high dose steroid. (F). ❖ Poor exercise tolerance is due to SARS (F).
Endocrine function	❖ Mr C's haemoglucostix is high (12mg/dL).	❖ High glucose level is caused by high dose steroid (F).
Psychosocial mode of adaptation	**1st Level Assessment**	**2nd Level Assessment**
Self concept mode * Personal self * Physical self	❖ Mr C is worried that the SARS infection will kill him. ❖ He also complains of insomnia when he is on the medical ward.	❖ He is worried because SARS can kill (F). ❖ He worries because his wife is also in hospital (C). ❖ He worries because he has had close relatives die in hospital before (R). ❖ His insomnia may be due to the dyspnoea caused by SARS (F). ❖ His insomnia may be related to steroid psychosis due to administration of high dose steroids (C).
Role function mode * Primary role * Secondary role * Tertiary role	❖ He is anxious because he is failing in the role of husband and father (in taking care of his wife and son). ❖ He is anxious because he is the only income earner in the family. His son (age 12) is now being cared for by Mr C's sister. ❖ Mr C does not have any special interests or hobbies.	❖ Primary role failure is due to hospitalisation (F). ❖ Secondary role failure is also due to hospitalisation (F).
Interdependence mode	❖ Mr C feels depressed because he cannot see his family for adequate emotional support.	❖ Inadequate emotional support is due to the isolation policy in ICU (F).

F = Focal stimuli; C = Contextual stimuli; R = Residual stimuli.

Table 2: Nursing assessment based on the Roy adaptation model on admission to ICU.

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